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The effects of the fluctuations in oil prices on the balance of payments of the GCC countries

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THE EFFECTS OF THE FLUCTUATIONS IN OIL PRICES ON THE BALANCE OF PAYMENTS OF THE GCC COUNTRIES

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DECLARATION

I hereby certify that this thesis has not been submitted previously as part of the requirement of another degree and that it is the result of my own independent research.

Mohammad Ali Rammadhan

DEDICATION

To my mother, my beloved wife Dina, and my beautiful daughter Asma, for the devotion and support given during the research project.

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Praise be to God, Who taught man what he knew not (The Holy Quran: 96-5).

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THE EFFECTS OF THE FLUCTUATIONS IN OIL PRICES ON THE BALANCE OF PAYMENTS OF THE GCC COUNTRIES

ABSTRACT

Existing literature on economic development of the Gulf Co-operation Council (GCC) countries has many gaps. Perhaps, the most important is the impact of fluctuations in oil prices on the external performance of the GCC members. This thesis tries to bridge some of these gaps by examining the effects of fluctuations in oil prices on the balance of payments of four members of the GCC, namely, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. The thesis determines the long-run relationship between oil exports and aggregate imports. The roles played by different components of final expenditures in determining the short and long-run demand for imports is assessed. The thesis also examines the impact of fluctuations in oil prices on the resource balance of the four members and analyses the trade relationship between the GCC and its major trading partners. The statistical results are used to forecast the future behavior of the balance of payments under various scenarios of oil prices.

The thesis uses different econometrics techniques to achieve its objectives. These include: Engle-Granger and Johansen-Juselius methods of cointegration, short-run Error Correction Model (ECM), single and simultaneous equations models, and simultaneous forecasting models.

The analysis suggests that fluctuations in oil prices over the period 1970-97 have affected the balance of payments of the GCC tremendously. The decline in oil revenues resulted in a decline in the proportion of oil exports to the GDP. The surplus in trade balance has also declined in all members. This has resulted in further deterioration in the current account of all members, except Kuwait.

The Engle-Granger and Johansen-Juselius methods of cointegration revealed the existence of a long-run relationship between oil exports and imports in all GCC countries, with the exception of Kuwait. The cointegration analysis also revealed the existence of a long-run relationship between imports and components of final expenditures in all members, except the UAE. The econometric results suggest that the long-run demand for imports is mostly determined by investments expenditure in Kuwait, by exports expenditure in Oman, and by government consumption expenditure in Saudi Arabia.

The simultaneous equations models results revealed that the resource balance of the members is negatively correlated with non-oil income and positively correlated with growth in the world economy. The non-oil income is more affected by changes in government expenditure than by changes in export revenues. It was also found that the response of the non-oil sector to changes in exports and government expenditure is subject to a partial adjustment mechanism. The GCC exports are strongly influenced by oil prices and growth in oil consumption of major trading partner.

The simultaneous-equations model results also indicate that there are very significant feedback effects in GCC trade with the USA, the EU and Japan, when the GCC is taken as an integrated block. The results suggest that GCC exports are strongly influenced by oil prices and growth of GDP of the major trading partners. The results also suggest that GCC imports are positively related to the GCC exports to the specific partner within a partial adjustment mechanism. It was also found that the short and long-run marginal propensity of GCC imports from the major trading partners differ significantly.

The forecasting analysis revealed that stabilization in oil prices will result in a continuous reduction in the surplus of the resource balance. The opposite is true if there was a steady growth in the world economy. A reduction in oil prices combined with a recession in world economy will result in a severe deterioration in the resource balance of the members of the GCC.

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Chapter One

INTRODUCTION

1.1 Background to the Study

The Gulf Co-operation Council (to be referred hereafter as the GCC) was created on Feb 4th 1981. The council includes six members: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates. The members of the GCC are rich major oil exporters with huge oil reserves; Bahrain is the only exception. Since the sharp rise in oil prices after the oil embargo in 1973, the members enjoyed high levels of oil revenues and economic growth. This has contributed directly toward the achievement of ambitious human and physical development targets. However, the GCC oil revenues have fluctuated significantly since 1974. The fluctuations in oil prices were the result of changes in the supply of and demand for oil. The increase in oil supply by old and new producers and the reduction in oil consumption by the industrialized countries depressed the oil prices significantly after 1983. Subsequently, economic growth of the GCC members has fluctuated throughout the last three decades, (Metwally, 1987 and 1993).

The economies of the members of the GCC are open economies that depend heavily on the outside world. This is evident from the following facts:

1. The percentage of exports to GDP ranges between 35 and 45 per cent. Oil exports contribute well over 90 per cent of total exports.
2. Imports constitute 25 to 30 per cent of GDP. Members of the GCC import from the industrial countries most of their needs of consumer and capital goods.

3. The relatively weak absorptive capacity of the GCC economies has forced them to seek foreign markets for investing their external surplus.
4. The labor force in the GCC countries consists mainly of expatriates labor.

The GCC countries share many economic characteristics with the developed world including high per capita income, highly developed infrastructure, adequate educational system, sufficient health services, and social programs. On the other hand, the GCC economies differ from the developed economies with regard to how large the size of the public sector compared to the private sector. The highly centralized public sector is the major source of employment and spending in the GCC. The private sector has always played a secondary role. The GCC economies, however, share some economic characteristics with the less developed countries (LDCs) including the lack of an integrated financial sector, dependency on the exports of a single primary product, and the absence of a diversified manufacturing sector, (Narasimham, 1990).

The behavior of most economic activities in the GCC revolves around the oil sector. Since the oil embargo in late 1973, oil prices fluctuated sharply with serious impact on the GCC balances of payments.

1.2 Problem Statement

The current literature on the economic performance of the GCC countries leaves many questions unanswered. Some of these questions are:

1. Did aggregate imports and oil exports of each GCC member converge towards a long-run equilibrium, given the fluctuation in oil prices?
2. Which type of expenditure is considered the most important determinant of the demand for aggregate imports in the GCC countries?
3. What kind of economic policies would be significant in exerting an impact on the propensity to import in the GCC countries?
4. How do the fluctuations in oil prices affect the resource balance of the GCC countries? How does the interaction between internal and external economic variables affect the behavior of this balance?
5. What impact do the fluctuations in oil prices have on the interaction between the economies of the GCC and their major trading partners?
6. Is it possible to forecast the future behavior of the balance of payments of the GCC economies, given the high degree of volatility in oil prices?

The answers to the above questions require in-depth empirical analysis. This thesis attempts to perform this analysis.

1.3 Objectives of the Study

The main objective of this study is to analyze the impact of fluctuations in oil prices on the external performance of the GCC countries. Specifically, this thesis tries to:

1. Evaluate the impact of fluctuations in oil prices on the shaping up of the balance of payments of the GCC members over the period 1970-97.
2. Determine the long-run equilibrium between oil exports and aggregate imports.
3. Determine the short and long-run relationship between the aggregate imports and the components of final expenditures (GDP).
4. Assess the impact of the fluctuation in oil prices on the resource balance of the members of the GCC.
5. Examine the impact of fluctuations in oil prices on the interaction between the GCC and its major trading partners.
6. Forecast the future behavior of the balance of payments under various scenarios of oil prices.

1.4 Hypotheses of the Study

This thesis is based on a number of hypotheses:

1. Oil as a commodity has been subject to sharp price fluctuations over the past three decades.
2. Fluctuations in oil prices can exert a significant impact on the main components of the balance of payments in the GCC countries.
3. The GCC aggregate imports is related, in the long-run, to GCC oil exports.

4. Various types of expenditures (exports, investment, private consumption, and government consumption) play equal roles in determining the long-run demand for the GCC imports.
5. The fluctuations in oil prices have a significant impact on the resource balance of the GCC countries.
6. The fluctuations in oil prices affect the process of interaction between the GCC countries, as an *integrated* unit, and its major trading partners.

1.5 Methodology

This thesis will use economic analysis and econometrics methods in achieving its objectives. In particular:

1. The study applies the Engle-Granger method and the Johansen-Juselius approach to cointegration in examining the long-term equilibrium between imports and oil exports in the GCC countries.
2. The Johansen-Juselius multivariate technique to cointegration is used to evaluate the role played by different types of expenditures in determining aggregate imports of the GCC countries.
3. A short-term error correction model is developed and tested to estimate the short-run partial elasticities of imports in the GCC members.
4. A simultaneous equations model is developed and tested to examine the impact of fluctuations in oil prices on the resource balance of members of the GCC.
5. A simultaneous equations model is developed and tested to assess the impact of fluctuations in oil prices on trade relationship between the GCC and its major trading partners.

6. Simultaneous-equations models are used to forecast the future behavior of the balance of payments of the GCC countries under various scenarios.

1.6 Plan of the Study

The thesis is divided into ten chapters. Chapter two reviews the literature on the GCC economies. Section one reviews the literature on trade and economic growth, while section two reviews the studies related to the GCC economies.

Chapter three examines the present structure of the GCC economies in order to lay the foundation of the following chapters. The chapter is divided into seven sections. Section two presents a brief historical background of the formation of the GCC. Section three discusses the importance of oil to the members of the GCC. Section four examines the structure of the GCC aggregate supply by economic sector and the GCC aggregate demand by type of expenditure. Section five briefly examines the public finance of the GCC countries. Section six analyses the structure of the GCC population, labor force, and basic social indicators.

Chapter four examines the effect of fluctuations in oil prices on the main components of the members of the GCC balance of payments over the period 1970-97. Section two presents the trends in oil prices during the period 1960-1997. Section three examines the balance of payments performance of the GCC members. The analysis covers the balance of trade, the balance of current account, and the capital account. Section four examines the affect of fluctuations in oil prices on the main components of the balance of payments.

Chapter five examines the long-run equilibrium between aggregate imports and oil exports in the GCC countries by applying the Engle-Granger method and the Johansen-Juselius approach to cointegration. The chapter is divided into five sections. Section two examines the results of the Augmented Dickey-Fuller and Phillips-Perron unit root tests. Section three examines the results of Engle-Granger method of cointegration. Section four examines the results of the Johansen-Juselius method of cointegration.

Chapter six applies the multivariate cointegration analysis to determine the long-run relationship between imports and components of final expenditures. This chapter also develops and tests a short-term error correction model to estimate the short-run partial elasticities of aggregate imports in the GCC members. The chapter is divided into six sections. Section two briefly reviews the relevant literature related to the imports demand function. Section three outlines the model and discusses the data used in the study. Section four examines the empirical results and their implications. Section five develops and tests a short-run error correction model.

Chapter seven examines the impact of the fluctuation in oil prices on the resource balance of the members of the GCC. The chapter is divided into four sections. Section two develops and tests a single-equation model to find out the main determinants of the resource balance of the GCC economies. Section three develops and tests a simultaneous-equations model to examine the impact of the interaction between the GCC economies and the rest of the world on the resource balance of the GCC countries.

Chapter eight develops a simultaneous equations model to test for the feedback effects in the GCC trade relationship with its major trading partners. The chapter is divided into five sections. Section two briefly discusses the trends in GCC trade with its major trading partners. Section three develops a simultaneous equations model to test the process of interaction between the GCC integration and its major trading partners. Section four reports the regression results of the simultaneous equations model.

Chapter nine forecasts the future behavior of the balance of payments under various scenarios and different oil prices. The chapter is divided into five sections. Section two discusses the various scenarios and assumptions used in the forecasting. Section three lists the results of the models, which will be used in the forecasting of the behavior of the resource balance of the GCC economies. Section four outlines the results of the forecasting.

Finally, chapter ten summarizes the main conclusions and findings of the thesis and offers some recommendations. The thesis presents a brief appendix on the concept of cointegration and offers a bibliography for reference by future researchers.

Chapter Two
Review of Literature

2.1 Introduction

Many researchers devoted their time and skill in tackling problems related to trade and growth. However, the role of trade in the economies of the oil producers came to the interest of some researchers only recently and more precisely since the oil embargo in late 1973. The main purpose of this chapter is to review the literature that is relevant to the theme of this thesis.

The chapter consists of three sections. Section two reviews some of the most important contributions to the relation between exports and economic growth. Section three reviews the literature related to the GCC economies. The final section summarizes existing gaps in the literature and highlights the contribution of this thesis towards closing some of these gaps.

2.2 The Relation between Exports and Economic Growth

The importance of export expansion as a key factor in promoting economic growth has been emphasized among advocates of export-oriented policies. The followers of export promotion policy regard exports as one of the most important vehicles of economic growth especially in developing countries. The staple theory of growth indicates that exports of primary products promote the growth of the rest of the economy (Tamaschke, 1980). Exports contribute to economic growth directly through their contribution to GDP, and indirectly, through their contributions per medium of spread or carry-over effects.

The most important direct benefit of an increase in the level of exports is the subsequent increase in the level of imports. These imports include capital goods and other inputs, which are needed for economic growth. The main indirect benefits of exports are the flow of technological innovations and managerial skills. The indirect contribution can be considered as a sequence of multiplier accelerator mechanisms (Metwally and Tamaschke, 1980). The indirect contribution of exports is expected to be weaker in the underdeveloped economies than in the developed economies due to institutional framework and backwardness (Syron and Walsh, 1968).

Various empirical studies concluded that a significant statistical correlation exists between exports and output growth. Emery (1967) examined the process of economic growth in 50 countries for the period 1953-63. He concluded that higher rates of growth tend to be associated with higher rates of exports growth. Michaely (1977), in his study of 41 countries, found a significant relationship between the change in the share of exports in GNP and the rate of change in per capita income. Balassa (1978) found a significant relationship between exports and GNP growth for 11 industrial countries that have established import substitution and export expansion policies. Williamson (1978) in his study of Latin American countries during 1960-74, indicated that growth in real GDP was highly related to growth in exports, private direct investment, and foreign capital inflows.

Tayler (1981) introduced exports in addition to capital and labor in cross section equations to explain inter-country differences in rates of growth of middle-income countries (1960-77). He found a significant correlation between the growth of

manufacturing output, investment, total exports, and manufacturing exports. Feder (1983) separated the effects of exports on economic growth into two parts: productivity differentials due to differences between exports and non-exports sectors and externalities generated by exports. Feder concluded that export-oriented policies led the economy to a better allocation of resources and productivity.

Balassa (1985) examined the export-economic growth relationship for 43 developing countries in the period of external shocks after 1973. The study showed that the rate of economic growth is significantly affected by the rate of growth in exports and further influenced by increase in the labor force and by domestic savings. In contrast with the views that countries at lower levels of development have more limited possibilities for economic growth than middle income countries, Balassa found that the rate of economic growth will be higher the lower is the level of economic development. See also Rana (1988).

Tamaschke (1988) examined the relation between exports and economic growth in Australia during the period 1955-83. The results suggest the presence of strong lagged relation (up to four years lags) between the changes in exports and changes in GDP and per capita GDP. See also Tamaschke (1990).

To avoid the problem of bias in estimating single equation models, Esfahani (1991) and Lee and Cole (1994) used simultaneous models that introduced exports as an endogenous variable. They found that exports play more important role in economic

growth than previously estimated. For more studies related to the relation between exports and economic growth, see Kavoussi (1984), Scott (1993), lee (1995), Storm (1997).

Most economists agree that free trade improves efficiency and raises aggregate welfare, but they are divided on the level and distribution of losses suffered by producers when trade barriers are removed. The Heckscher-Ohlin model (H-O) of international trade is the most widely used theory to explain the link between trade and wages. The model explains the pattern of international trade by reference to the relative abundance of factors of production among trading partners sharing the same technology, (Appleyard and Field, 1992).

The new theories of international trade incorporate important determinants of the pattern of international trade such as increasing returns to scale, technological innovation, product differentiation and international oligopoly rivalry. Among the contribution to this field, one may mention the work by Parikh (1984), Englander (1988), Bergstand (1990), Clarida and others (1992), Levine and others (1993), Patibandla (1994), Burtless (1995), and Krueger (1997). Terms of trade were examined by many other researchers including Findlay (1980), Basu and Mcleod (1992), Bakus and others (1994), Darity (1990), Salvatore (1990), and Krueger, (1992).

2.3 Studies Conducted on the GCC Economies

The economic and social development of the members of the GCC attracted extensive amount of research since the oil boom in 1974. Azam (1986) examined the GCC economies during the period 1984-86 (after the decline in oil prices). The author focused on the development of the financial and capital markets in the region, and the declining construction sector. The study showed that the GCC was not prepared to deal with the decline in oil prices. Osama (1987) examined the obstacles facing the implementation of proper development in the GCC. The main obstacles, in his point of view, were the dependence of the economy on one non-renewable resource, the pressure of external forces and interest, and the lack of serious efforts to break the destructive circles of underdevelopment and backwardness.

Many studies proposed different strategies to diversify the income sources of oil exporting countries. Haddad (1993) proposed a long-term strategy for converting the transient oil resources of the oil exporting countries in the Middle East, into producible and more lasting wealth. The strategy comprises two phases; the first phase focuses on acquiring the capacity to produce goods and services needed locally (import substitution). The second phase emphasizes efficiency and quality method of production. The states owning the oil resources are expected to play a critical role in encouraging the emergence of a dynamic entrepreneurial and managerial class. The new class of labor is well needed for the development of labor and skill-intensive industries.

Baker and Abou-Ismail (1993) showed the importance of the GCC for the European. Japanese and American export market. The article designed effective and

efficient marketing strategies for international businesses in order to affect the affluent consumers in the Gulf. Milner and others (1992) focused on trade between the European Community (EC) and the Middle East and particularly the completion of a single market and its effect on the level of trade. The issue of protectionism and the importance of reciprocal trade were discussed in depth. See also Metwally (1979).

Kamran (1990) examined the economic consequences of the 1980 Gulf war between Iran and Iraq on countries of the Persian Gulf. The rapid increase in the GCC's military expenditure since the late 1970s took place when oil revenues have been declining. The author estimated the opportunity cost (potential loss in foreign exchange reserves) of excessive military spending in Saudi Arabia and Kuwait during the period 1975-85. He concluded that if military spending was reduced to about 4.5 per cent of GDP; and the difference between actual and potential spending was invested abroad, then by the end of 1986, its compound value could have increased to US$ 231 bn Saudi Arabia and US$89 bn in Kuwait.

Stevens (1997) challenged the dominant view that the world will be forced into growing dependence upon Gulf oil due to the large oil reserves in the Gulf. He indicated that new technologies have reduced costs and will increase oil reserves particularly the offshore drilling. Privatization of oil companies in many countries led to better management and cost effectiveness and ultimately increased non-OPEC supply. The author also examined factors affecting the demand side and recommended that the GCC should start the privatization of the oil industry and the attraction of foreign investment. Tucker (1995) emphasized the importance of natural gas in offsetting oil imports in the United States. Thus decreasing dependency on the Middle East oil. Shaalan and Haudy (1991) discussed the fluctuations in oil revenues and their effects on

the current account. They also analyzed the effectiveness of development policies pursued by some Gulf States.

2.3.1 Oil Exports and Economic Growth in the GCC

Economic growth in the GCC depends largely on revenues from oil exports. Many studies attempted to examine the relation between oil exports and growth in the GCC and the Middle East. Metwally and Tamaschke (1980) examined the role played by oil exports in the process of economic development of the major oil producers of North Africa and the Middle East over the period 1960-80. The authors focused on determining the time lags between export growth and economic growth. A Koyck distributed lag scheme was used. The model imposed geometrically declining weights from the current period, which had the most important weight. The result suggested that in all sampled countries, investment opportunities generated by oil exports were not exploited; or, in other words, the current period spread effects is greater than lagged periods. Finally, the investment analysis suggested that gross fixed capital formation in Algeria, Iran, Iraq and Saudi Arabia is extremely sensitive to growth in oil exports.

Metwally and Abdel-Rahman (1985) tested the export-led growth hypothesis on Saudi Arabia during the period 1970-82. The results indicated a significant correlation between exports and GDP and between exports and non-oil GDP. The results of the sectoral analysis showed no evidence of spread effects, except for the manufacturing sector.

Yousefi (1995) re-examined the impact of oil exports on the economy of OPEC countries during the period 1966-80. A model was developed using Koyck transformation of distributed lag to estimate GDP, non-oil GDP, and the share of manufacturing sector in GDP as a function of oil exports. The regression results showed that current period oil revenues have positive impact on the economy of all OPEC countries, except Kuwait and Saudi Arabia. The results also showed that while income form oil has negative impact on the non-oil sector, the lagged oil revenues was more significant in explaining the variation in the non-oil sector. Furthermore, the short-term impact of oil revenue on growth of manufacturing industries of OPEC countries was very weak. This indicates that the manufacturing industries grew independent of oil exports.

Al-Yousif (1997) investigated the relationship between exports and economic growth in four of the GCC countries, namely, Saudi Arabia, Kuwait, UAE, and Oman for the period 1973-93. The author presented two models to test the relationship between exports and growth. In the first model, real aggregate output was estimated as a function of labor, capital inputs, exports, government expenditure, and the terms of trade. In the second model the author included a variable to measure the external effect stemming from the export sector to the non-export sector. The regression results indicated a strong relationship between exports and real aggregate output. The estimated coefficients were relatively large when compared with the results of previous research.

Metwally and Daghistani (1986) developed a simultaneous equation model to test the degree of interdependence between the economies of the member states of GCC and industrialized countries. The interaction can be explained into two ways. First, an

increase in oil exports of GCC can result in an increase in their income and subsequently an increase in their imports. The increase in imports represents an increase in the incomes of industrialized countries. This rise in income stimulates demand for oil and thus increases the exports of the GCC. Secondly, a rise in oil prices would increase costs of production of the oil importers. This may slow their demand for GCC oil. The main findings of the model are:

1 Oil prices and economic growth in the industrialized countries are significant determinants of current export proceeds in all members of the GCC.

2 The current levels of imports do not determine the levels of exports of the GCC, suggesting absence of feed back effects.

3 The marginal propensity to import with respect to non-oil income is very high.

4 The industrial production of the industrialized countries was not significantly influenced by the GCC imports.

Many studies developed econometric techniques and models to identify functional relationships in the GCC economies. Metwally (1987) and (1993) attempted to examine the determinants of the external surplus (S=X-M) of the oil producing members of the GCC. In spite of the sharp rise in oil prices during the 1970s, the GCC countries could not improve their external surplus per exported barrel. This indicated that the rise in oil prices was greatly matched by a larger increment in imports and by the fall in the volume of exports. Metwally tested the hypothesis that the external surplus balance varies inversely with GDP. In contrast to economic theory, the results showed that (X-M) is positively correlated with GDP in the case of GCC countries. The result was explained by the fact that total GDP in the GCC countries is dominated by oil revenues which is owned by government and not directly available for domestic

expenditure. Thus an increase in oil exports would increase total GDP and add to overall surplus. When non-oil income was used instead of total GDP, a significant negative correlation was obtained between non-oil income and the external surplus. Metwally also developed a simultaneous equation model to test the interaction between the economies of the GCC and the rest of the world. The oil exports of the GCC responded favorably to the increase in OPEC share in world oil supply and the increase in world oil consumption. Finally, the marginal propensity to import out of non-oil income was extremely high in all GCC countries. This resulted in an "*import trap*", i.e. a tendency to increase imports even when the value of exports is declining.

Al-Habib and Metwally (1986) studied the balance of payment in the GCC over the period 1973-1983. They found that the ratio of merchandise exports to GDP remained high throughout the period (above 90 per cent). This suggests that the sharp increase in oil revenues did not contribute toward diversification of the economy by creating other important sources of income. The regression results of the import function indicate that the value of import elasticity with respect to GDP was well over one in Kuwait, Oman, Qatar, and Saudi Arabia and very close to one in both Bahrain and the UAE. For the GCC to have high-income elasticity of imports while their oil exports is declining should result in a large balance of trade deficit. Many other researchers including Metwally and Arab (1987) and Al-Faris (1997) estimated different price elasticities.

Metwally (1993a) examined the import patterns of the members of the GCC and found that the reduction in oil revenues of the GCC countries following the fall in oil

prices in 1982 has completely disturbed the import-income relationship which was developed during the boom years 1974-81. The marginal propensity to import of most import groups diminished during the period 1982-89. Furthermore, the income elasticity of demand of all imports groups increased during the slump period. Asseery and Perdikis (1993) used Box and Cox analysis of transformation to choose appropriate import demand function for the GCC. The linear model was found to be appropriate in the case of Kuwait and Oman only. While log linear model proved to fit Saudi Arabia, UAE, and Qatar.

Haji, Mohammad, and Al-Salman (1995) applied input-output analysis to identify key sectors in the GCC countries for the period (1976 - 85). The authors measured different concepts of linkage such as potential and domestic backward and forward linkages, import and export linkages, income multiplier, indirect tax multipliers and consumption multiplier. The authors examined the implications of linkage based development strategy for efficiency, domestic resource costs, and choice of technology and found that such strategy will mostly lead to an inefficient and capital intensive pattern of resource allocation with high domestic cost.

Metwally and El-Din (1996) developed a simultaneous equation model to estimate economic multipliers for each GCC country. The authors found that there is a negative correlation between the size of the multipliers and the degree of diversification of the economy. The money supply multiplier was found to be less than the government expenditure multiplier in all members. This indicated the significance of fiscal policy as a control tool over monetary policy. See also Morgan (1979).

Al-Badri and Cain (1990) implemented a dynamic model for production and trade in GCC region. The model revealed long-term relations between labor utilization and inter-regional trade. The model also emphasized the importance of changes in a particular economic policy on the performance of the economy in the light of volatile and unstable energy market. The model portrayed a path of development which considers the region need to establish capital goods producing industries. The authors conclude that the level of development of each member of the GCC will be higher if inter-trade and development were implemented within the framework of the GCC.

Narasimham (1990) attempted to design a macroeconometric model for the GCC that can be used for economic policy implementation and forecasting. The model distinguishes between the oil and non-oil sectors of the economy. The real non-oil output, through its contribution to real GDP, translates into real income components which are the major determinants of the private expenditure components. The oil sector enters the model in two ways. First, through value added toward output determining real GDP. Second, through government oil revenues, which feeds directly into nominal income. The large export component of the balance of payments feeds into financial sector, and eventually aggregate domestic demand. The author simulated the GCC economies for the period 1987 and 2010 under different crude oil prices.

Moosa (1986) estimated an econometric model of Kuwait monetary sector. Two studies related to Kuwait were conducted to estimate the non-oil GDP. Yousif and Mohammad (1990) examined the influential role of government expenditure in shaping the non-oil sectors in Kuwait. Hoque and Al-Mutairi (1996) estimated an econometric

variables until the year 2000. Perera (1994) estimated the long run money demand function of the GCC countries using Johansen's cointegration techniques.

2.4 Summary and Conclusions

Despite the growing literature on the economies of the GCC, it appears that many gaps still exist in the current literature. In particular:

1. No attempt has been made to examine the performance of the GCC balance of payments over a long period of time and link the disturbances in the main components of the balance of payments directly to the fluctuations in oil prices.
2. No empirical evidence exists on the effectiveness of the macroeconomic policies regarding the long-run relationship between aggregate imports and oil exports of each GCC member. More importantly, whether the fluctuation in oil prices distort the convergence of these two significant expenditures.
3. It appears that no attempt has been made to determine which type of expenditure is considered most important in influencing the long-run demand for aggregate imports in the GCC countries. In particular, what type of economic policies would be significant in exerting an impact on the propensity to import in the GCC countries?
4. No previous attempt has been made to examine the interaction between the members of the GCC, as an *integrated economic unit*, and its major trading partners.
5. Many studies developed econometric models to forecast the behavior of different economic variables in the GCC. Very few of these studies used simultaneous

equations models to forecast the future behavior of the balance of payments of the GCC economies under different scenarios.

This study attempts to close some of the existing gaps in the literature on the GCC economies. It intends to examine the above issues, among others, analytically and statistically. In particular, this thesis intends to:

1. Evaluate the impact of fluctuation in oil prices on the performance of the balance of payments of the members of the GCC.
2. Determine the long-term relationship between oil exports and aggregate imports in the GCC countries.
3. Assess the role played by different types of expenditures in determining aggregate imports of the GCC countries.
4. Examine the impact of fluctuations in oil prices on the resource balance of members of the GCC.
5. Examine the impact of fluctuations in oil prices on trade relationship between the GCC and its major trading partners.
6. Forecast the future behavior of the balance of payments of the GCC countries under various scenarios of oil prices.

Chapter Three
Structure of the GCC Economies

3.1 Introduction

Members of the Gulf Cooperation Council (GCC): Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, and the United Arab Emirates (UAE) share common features such as: religion, language, historical background, and social life. The GCC economies depend on similar natural resources and have a comparable structural base. Their economies depend entirely on the production of oil, and all economic sectors revolve around revenues generated by oil exports. The GCC also share the same socio-political system where the states, ruled by kings and princes, own most of the natural resources and the large public sector dominates all aspects of the economy.

It can be said that economic development in the GCC has passed through two stages. The first stage of development, from early 1970s to early 1980s, utilized the huge oil revenues to build up the basic infrastructure (physical and human). The second stage started from the mid 1980s. This stage witnessed the participation of the private sector in the process of economic development. The focus was to establish new industries that use modern technologies and managerial skills and result in a diversification of income. However, rigidity in the political system (bureaucracy) and lack of appropriate managerial skills and leadership are major obstacles. Even though the infrastructure in the GCC has developed to a stage similar to that of the developed world, the political decisions and policies are conducted in a different manner (Thornton and Aronson, 1997).

This chapter examines the structure of the GCC economies in 1997. The chapter is divided into seven sections. Section two presents a brief historical background of the formation of the GCC. Section three discusses the importance of oil to members of the GCC. Section four examines the structure of the GCC aggregate supply by economic sector and the structure of the GCC aggregate demand by type of expenditure. Section five briefly discusses the public finance of the GCC countries. Section six analyses the structure of the GCC population, labor force, and basic social indicators. Finally, Section seven summarizes the main conclusions.

The analysis will be confined to four GCC members namely Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. Bahrain and Qatar are excluded from the study. This is so because Bahrain is no longer an oil exporting country. Its oil production was less than 41 thousand barrel per day in 1994 compared to 2026, 810, 8085, and 2245 thousand barrel per day for Kuwait, Oman, Saudi Arabia, and the UAE respectively (Gulf Business Book, 1996). Qatar was excluded because of lack of data.

3.2 The Gulf Cooperation Council: A Historical Background

The Gulf Cooperation Council (GCC) was created on Feb 4th 1981 by six Arab Gulf states: Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, and the United Arab Emirates. The main motive for the creation of the GCC was to face the threat posed to the region's security by the Iran-Iraq war. The aims of the GCC formation are to develop co-operation and integration among the member states on foreign and defense policies and to promote common interest in economic, social, and cultural affairs.

Among the achievements of the GCC is free movement of its citizens and permission to own land and property (to a limited extent) in member states. However, the GCC failed to achieve any real progress on many issues. The annual summits are more of a show of a unity to the outside world to cover many separating issues. Regarding recent issues, the GCC is divided over the United Nations sanction against Iraq. There is a serious disagreement between Saudi Arabia and Qatar over the appointment of the general secretary. No progress has been made on the integrated regional defense force. The GCC also failed to implement the agreement of 1993 on tariff unification at 8 per cent (Saaty, 1997). The political aspects of the GCC have been studied by many researchers including Mansfield (1992), Al-Ahmad (1993), and Al-Ashal (1995).

3.3 The Importance of the Gulf Oil to the GCC

The exploration for oil began in the Gulf region in 1945. Since then, the Gulf oil has been important in the global energy market for many reasons. First, the oil reserves of the GCC are very huge in comparison to the world total reserves. As can be seen from Table 3.1, the GCC oil reserves constituted around 45 per cent of the world total in 1997. The amount of proven oil reserves in the GCC increased from 266.9 billion barrels in 1977 to 464.2 billion barrels in 1997.

Secondly, The GCC plays a significant role in the supply of oil to the world market. Between the years 1987 to 1997, the share of the GCC production in total world production has increased from 13.3 per cent in 1987 to 21.6 per cent in 1997. Thirdly, the geological factors such as: the location of the onshore oil fields close to the deep Persian Gulf, the flow of the oil toward the sea, and the effortlessness of drilling

helped the GCC oil to be produced relatively cheaper than that of the rest world. Finally, the central geographical location of the Persian Gulf between the developed economies in the West and growing economies of East Asia has reduced transport costs and increased the significance of the GCC oil market.

Table 3.1: World Oil Reserves and Production by Region in 1997

	Proved Reserves in Billion Barrels			Share of Reserves In 1997 (%)	Production in 1997 (mil tons)	Share of Production in 1997 (%)
	1977	1987	1997			
North America	56.9	93	76	7.3	668.8	19.3
South and Central America	26.4	65.7	86.2	8.3	330.9	9.5
Europe	30.3	24.2	20.2	1.9	327	9.4
Former Soviet Union	75	59	65.4	6.3	362.9	10.4
Middle East	365.8	564.7	676.9	65.3	1045.3	30.1
Africa	59.2	55.3	70	6.8	373.1	10.7
Asia Pacific	39.7	37.8	42.3	4.1	366.1	10.5
World Total	**653.3**	**899.7**	**1037**	**100**	**3474.1**	**100**
OPEC	436.2	668.4	797.1	76.9	1441.5	41.5
GCC	**266.9**	**369.3**	**464.2**	**44.8**	**751.9**	**21.6**

Source: BP Statistical Review of World Energy, June 1998.

Two major oil shocks have affected the world in general and the GCC in particular (Stevens, 1997). The first major oil shock was after the oil embargo of 1973. The increased demand for oil in the industrial world during the economic boom in the 1960s and 1970s and the disturbances of the oil supplies by the Arabs in 1973 caused prices to rise significantly. After 1973, the GCC enjoyed high oil revenues that lasted for almost a decade. The second oil shock took place in the late 1982. World oil demand fell reflecting a combination of recession, fuel switching and energy

conservation. As a result, the price of oil fell dramatically and the GCC suffered huge losses in oil revenues. Oil demand returned to its normal levels in the 1990s, however, oil prices stabilized at much lower levels than during the boom years.

3.4 Structure of Aggregate Supply and Demand in the GCC

Table 3.2 gives the Gross Domestic Product (GDP) of the four GCC members by type of economic activity. As can be seen from the table, the petroleum and mining sector forms the mainstay of the economy in the GCC. The oil contribution to GDP constitutes 30 to 40 per cent of total GDP. This contribution is the highest in Kuwait (40 per cent) and the lowest in Oman (32 per cent). The second most important economic activity is the services sector (wholesale and retail trade, transportation and communication, finance and insurance, real estate). The services sector contributes 20 to 30 per cent of GDP. The third most important sector is the government sector, which contributes 10 to 20 per cent of GDP. The manufacturing sector plays a moderate role in all members of the GCC. This sector contributes only 5 to 10 per cent of GDP. Contribution of the agricultural sector to GDP is very negligible (around 3 per cent). The GCC members heavily subsidized the state-owned electricity, gas, and water sector. This resulted in a minimal contribution of this sector towards the GDP (around 1 per cent).

Table 3.2: The GCC Gross Domestic Product by Economic Activity in 1997 (mil US$)

	Kuwait	%	Oman	%	S.A	%	UAE	%
Petroleum and Mining	12177	40.6	5267	32.6	45510	33.0	16501	35.4
Agriculture	130	0.4	479	3.0	9720	7.0	1140	2.4
Manufacturing	3315	11.1	918	5.7	12661	9.2	4189	9.0
Electricity, Gas & Water	-34	-0.1	161	1.0	232	0.2	648	1.4
Constructions	894	3.0	739	4.6	12666	9.2	4055	8.7
Wholesale, Retail Trade	2220	7.4	2047	12.7	9981	7.2	5329	11.4
Transport & communication	1274	4.3	1152	7.1	8972	6.5	3206	6.9
Finance & Insurance	930	3.1	523	3.2	8299	6.0	2545	5.5
Real Estate	2250	7.5	1332	8.2	2026	1.5	3684	7.9
Government Services	6221	20.7	3186	19.7	24924	18.1	5017	10.8
Other Services	-	-	203	1.3	6729	4.9	1206	2.6
GDP at Market Prices	29980	100.0	16154	100.0	137909	100.0	46615	100.0

Note: % indicates percentages out of total GDP.
Source: The GCC Economic Bulletin, The GCC General Council, No. 13, 1998.

Table 3.3 presents expenditure on GDP in the GCC countries in 1997. It can be seen that the proportion of total expenditure on exports and imports constituted a significant proportion of GDP. With the exception of the UAE, the proportion of exports and imports of goods and services of total GDP were around 40 and 35 per cent respectively. In the UAE these ratios were around 78 and 65 per cent respectively. Re-exporting is a major part of the UAE total exports (around 30 percent). Gross capital formation was around 15-20 percent of total GDP. This ratio was the highest in the UAE (26 per cent) and the lowest in the Kuwait (13 per cent).

The proportion of total expenditure on private consumption out of GDP is significant (around 45-50 per cent), though not as high as in advanced countries. The opposite seems to be true for government consumption. Government spending has increased significantly as a proportion of total GDP, (Azzam, 1985). Expenditure on public consumption was the highest in Kuwait (32%), followed by Saudi Arabia (26%), Oman (22%), and then the UAE (16%). Even though the members faced serious budget deficit in the 1990s, only Oman reduced its public expenditure. The remaining members, especially Kuwait, ran huge deficits.

Table 3.3: The GCC Expenditure on Gross Domestic Product in 1997 (million US$)

	Kuwait	%	Oman	%	S.A	%	UAE	%
Private Consumption	13286	44.3	7823	48.4	60434	43.8	21132	45.3
Public Consumption	9483	31.6	3469	21.5	36440	26.4	7454	16.0
Gross Fixed Capital Formation	4056	13.5	3854	23.9	27065	19.6	12317	26.4
Exports of Goods & Services	14037	46.8	6838	42.3	55182	40.0	36386	78.1
Imports of Goods & Services	10882	36.3	5831	36.1	41212	29.9	30673	65.8
Net Exports of Goods & Services	3156	10.5	1007	6.2	13970	10.1	5713	12.3
GDP at Market Prices	29980	100.0	16154	100.0	137909	100.0	46615	100.0

Note: figures between parenthesis are percentages out of total GDP.
Source: The GCC Economic Bulletin, The GCC General Council, No. 13, 1998.

3.5 Government Revenue and Expenditure

Table 3.4 provides data on government revenue and expenditure in the four GCC countries in 1997. It can be seen that, all the GCC members experienced a budget deficit in that year. Actually, most GCC budgets were in deficit for most of the years since 1985. With the exception of Oman, the deficit was around 3-4 per cent of GDP. This ratio was even higher in previous years. For example, in 1994, the deficit was

around 19.2, 7.1, and 6.9 per cent in Kuwait, Oman, and Saudi Arabia respectively. Many factors contributed to the persistent budget deficits. These include inconsistent policies, the huge subsidies, increased military expenditures, unproductive investments, and bureaucratic waste.

Subsidies are regarded as the main cause of the deficit. The GCC governments allocated generous direct and indirect subsidies to their citizens. These subsidies together with the generous salaries in the public sector were the indirect procedure of transferring oil revenues to citizens. However, this policy distorted the structure of the labor market with ultimate affect on the growth of the private sector. As a result of the downturn in oil prices, most of the GCC members proposed to impose charges on public services and cut welfare payments. The introduction of new charges may rationalize the consumption of electricity and water (Thornton and Aronson, 1997).

Table 3.4: The GCC Government Revenue and Expenditure (million US$)

	Kuwait	Oman	Saudi. A.	UAE
Total Revenues	3854	5903	54800	15436
Oil Revenues	-	4548	42667	11206
Non-Oil Revenues	-	1355	12133	4230
Total Expenditure	4730	5950	59013	17320
Investment Expenditure	556	1221	15573	4535
Current Expenditure	4174	4729	43440	12875
Surplus/(deficit)	(876)	(47)	(4213)	(1884)
(deficit) as % of GDP	2.92	0.29	3.05	4.04

Source: The GCC Economic Bulletin, The GCC General Council, No. 13, 1998

3.6 Population, Labor Force, and Social indicators

Table 3.5 gives data on the structure of the population of the four GCC members in 1997. Saudi Arabia has the largest population base (19 millions) compared to the other three members (around 2.5 millions). The GCC total population in 1997 (including Bahrain and Qatar) was around 27 millions. The GCC depends heavily on expatriates to conduct the economic activities. The proportion of nationals out of total population varies from one country to another. This ratio is very small in Kuwait and the UAE (41 and 25 per cent respectively) compared to Oman and Saudi Arabia (70 per cent). Even though the GCC fertility rate is among the highest in the world, their dependence on foreign labor does not seem to be decreasing.

Table 3.5: The GCC Total Population in 1997 (thousand person)

	Kuwait		Oman		S.A		UAE	
Total Population	2209		2256		19315		2696	
Nationals	905	(41.0)	1646	(73.0)	13520	(70.0)	674	(25.0)
Expatriates	1304	(59.0)	610	(27.0)	5795	(30.0)	2022	(75.0)

Note: figures between parenthesis are percentages out of total population.
Source: The GCC Economic Bulletin, The GCC General Council, No. 13, 1998.

The distortion in the labor market is another dimension of the imbalance in the population mix. Table 3.6 shows the labor force in three GCC members by economic sector. No detailed data were available for Oman. The data in this table suggest the following:

- The petroleum and mining sector, which represent 30-40 per cent of the GDP, employs only around 1 per cent of the labor force.
- .Government, social and personal services absorb around 56, 44, and 26 per cent of the labor force in Kuwait, Saudi Arabia, and the UAE, respectively.

- The services sector (wholesale and retail trade, transportation and communication, finance and real estate) absorbs a significant proportion of the labor force (around 23-30 per cent). This sector is almost fully dependent on expatriate labor.
- The manufacturing sector employs around 6-12 per cent of the labor force.
- The constructions sector employs around 11-18 per cent of the labor force.
- The agricultural and fishing sector employs around 2-7 per cent of the labor force.

As for Oman, the proportion of the labor force engaged in agriculture, industry, and services in 1994 was around 49, 22, and 29 per cent respectively. The structure of Oman labor force differs from the other GCC members. Employment in the public sector in Oman is not as large as in the other members. The private sector in Oman employs more than 85 per cent of the labor force. The agricultural sector absorbs a significant portion of the labor force, (Al-Yousef, 1995). In contrast to Oman, nationals in the remaining members depend heavily on the public sector for employment. For example, the Kuwaiti citizens represent about 1.3 and 50 per cent of the labor force in the private and public sectors, respectively. The nationals in the UAE, citizens represent about 3 and 35 per cent of the labor force in the private and public sectors, respectively (Ayubi, 1997).

Table 3.6: Labor Force by Economic Sector in 1997

	Kuwait		Saudi. A.[1]		UAE	
Petroleum and Mining	8297	(0.7)	76000	1.1	24102	1.8
Agriculture, Livestock	23667	(1.9)	377000	5.5	99498	7.5
Manufacturing	81028	(6.6)	550000	8.0	169730	12.8
Electricity, Gas & Water	8137	(0.7)	80000	1.2	23044	1.7
Construction	135447	11.0	1061000	15.4	250600	18.8
Wholesale, Retail Trade	200414	16.3	1037000	15.1	277616	20.9
Transport & communication	42395	3.4	320000	4.7	95795	7.2
Finance & Insurance[2]	44398	3.6	330000	4.8	19476	1.5
Real Estate	-	-	-	-	33285	2.5
Government Services	-	-	-	-	144017	10.8
Social & Personal[3]	688993	56	3037000	44.2	192340	14.5
Total Labor Force	1232776	100.0	6868000	100.0	1329503	100.0

1. The figures for Saudi Arabia were from 1994.
2. For Kuwait and Saudi Arabia, the finance and real estate sectors are combined in one figure.
3. For Kuwait and Saudi Arabia, the government and social services sectors are combined in one figure.

Sources: Ministry of Planning, Kuwait, Population Main Characteristics, 1998. The Economists Intelligence Unit, Country Profile, Saudi Arabia & UAE, 1998.

Table 3.7 summarizes the main social indicators in the four GCC members. It can be seen that the life expectancy rate is well above 70 years for all the members. Infant mortality rate is far below world average (World Bank, 1996). The number of population per physician is very low, especially in Kuwait and Saudi Arabia. The fertility rate in the GCC, though declined in the 1990s, is still among the highest in the world. This was largely due to government's efforts to increase the population base. Generous family allowances are paid to GCC citizens. Spending on education contributed directly to the decline in the illiteracy rate.

Table 3.7: The GCC Social and Development Indicators

	Kuwait	Oman	Saudi Arabia	UAE	World Average
Life Expectancy at Birth	76	70	70	75	67
Fertility Rate (births per woman)	3.0	7.1	6.3	3.6	2.9
Infant Mortality Rate (per 1000 live births)	11	18	26	9	58
Population per Physicians	617	1203	698	1095	N/A
Access to Safe Water (% of population)	100	57	100	95	N/A
Illiteracy	21	N/A	37	25	N/A

Note: figures in this table are for the year 1994.
Sources: Social Indicators of Development, World Bank (1996). UN Development Program, Human Development Report, (1998)

3.7 Conclusions

This chapter examined the structure of the economies of four members in the GCC in 1997. The main findings of this chapter may be summarized in the following:

1. Oil is the mainstay of the GCC economies. The huge oil reserves shaped the GCC countries as major suppliers in the energy market. The petroleum and mining sector contributes around 30 to 40 per cent of total GDP. Non-oil sectors played a moderate role in all GCC economies.

2. All the GCC countries covered by this study experienced a budget deficit in 1997. Subsidies and the high salaries in the public sector are regarded as the main cause of the deficit.

3. The proportion of nationals to total population is very small.

4. The government, social and personal services absorb a significant proportion of the labor force. The petroleum and mining sector employs only 1 per cent of the labor force. Nationals in the members of the GCC depend heavily on the public sector for employment; the only exception is Oman.

5. The social indicators of the GCC are comparable to that of the developed world.

Chapter Four

Analysis of the GCC Balance of Payments Performance

4.1 Introduction

Members of the Gulf Cooperation Council (GCC) are open economies that depend greatly on the outside world. Firstly, the percentage of exports to GDP ranges between 35 and 45 per cent. Oil exports contribute well over 90 per cent of these exports. Secondly, imports contribute 25-30 per cent of GDP. Members of the GCC import most of their needs of consumer and capital goods. Thirdly, members of the GCC depend heavily on foreign labor. Fourthly, due to the small domestic absorptive capacity, a significant proportion of the members' surplus is invested overseas. The behavior of most economic variables revolves around the oil export sector. Since the oil embargo in late 1973, oil prices fluctuated sharply with serious impact on the GCC balances of payments.

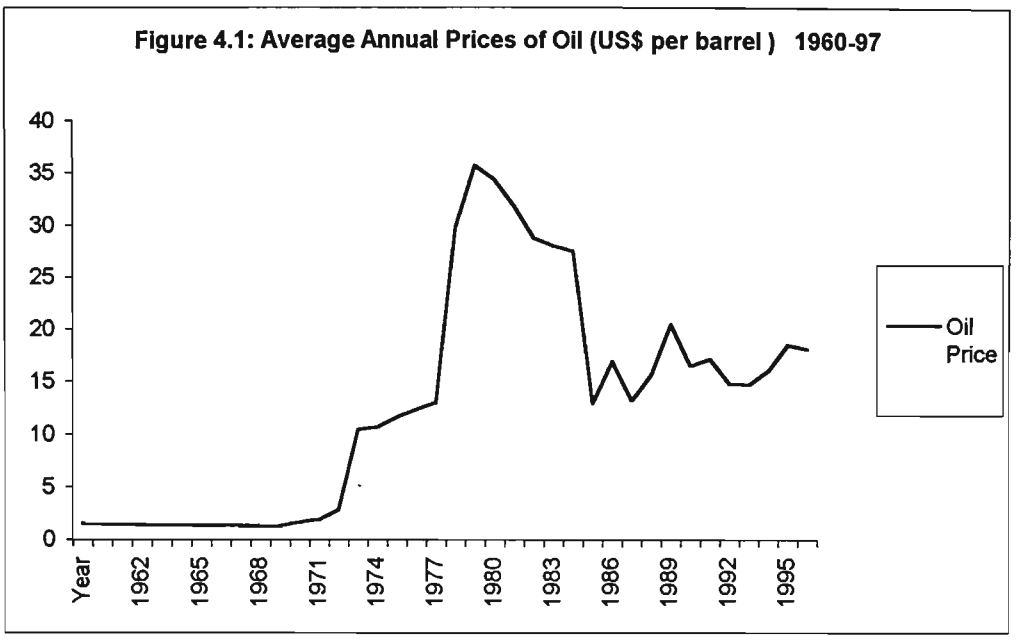
The aim of this chapter is to analyze the behavior of the foreign transactions included in the balance of payments (BoP) statistics of four GCC members: Kuwait, Oman, Saudi Arabia, and United Arab Emirates (UAE). The chapter is divided into five sections. Section two presents the trends in oil prices during the period 1960-1997. Section three examines the performance of the balance of payments of the GCC countries during the period 1970-97. The analysis will cover the balance of trade, the balance of current account, and the financial account. Section four examines the affect of fluctuations in oil prices on the main components of the balance of payments. Finally, the main conclusions of this chapter are summarized in section five.

4.2. The Fluctuations in Oil Prices During 1960-1997

Since the main aim of this thesis is to find the impact of fluctuations in oil prices on the main components of the balance of payments, it is important to examine the trends in oil prices during the period 1960-97. It is possible to distinguish four sub-periods over which oil prices fluctuated heavily. These sub-periods are:

1. 1960-1973
2. 1974-1982
3. 1983-1989
4. 1990-1997

The behavior of oil prices over these sub-periods is illustrated in Figure 4.1. It can be seen that the first sub-period (1960-73) was characterized by low oil prices with a high degree of stability. During this period oil prices ranged between US$1.33 and US$1.93 a barrel. During the second sub-period (1974-82) oil prices rose sharply, particularly after the oil embargo in 1973. In this period, the average price reached $36 per barrel. During the third sub-period (1983-89), oil prices declined sharply at the beginning and then stabilized at approximately half their level in 1982. There were many reasons behind the decline in oil prices in this period. Stagnant demand by oil consumers on the one hand and abundant surplus from producers on the other hand forced prices to decline to a lower equilibrium level. The industrial world adopted new efficient technologies directed towards energy conservation. The massive production of oil by non-OPEC members has also contributed toward the increase in oil surpluses. The fourth sub-period 1990-97 witnessed relative stability. The average price was stable around $17, (Schneider, 1983; Yergin, 1992; Adelman, 1995).



4.3 Performance of the Balance of Payments of the GCC Countries during the Period 1970-97

To show the long-term effect of fluctuations in oil prices on the components of the (BoP), five different years within the period 1970-97 were selected. These years are 1970, 1976, 1983, 1989, and 1997. Tables 4.1 to 4.4 present the (BoP) of Kuwait, Oman, Saudi Arabia, and the UAE respectively. The data in these tables suggest the following:

1. The proportion of oil exports out of merchandise exports has been declining gradually in all the members except Kuwait, where the ratio averaged well above 90 per cent throughout the period. Oman and Saudi Arabia oil exports accounted for 99 and 98 per cent of merchandise exports in 1983, respectively. By the year 1997, this ratio has declined to 76 and 81 per cent, respectively. The ratio declined in Saudi Arabia even though its oil exports increased significantly since the Persian war in 1990, as can be seen in Table 4.3. However, the largest decline of this ratio

was in the case of the UAE. The ratio of oil exports to merchandise exports has declined sharply from 93 per cent in 1970 to 40 per cent in 1997. The decline in this ratio is mainly due to the downturn in oil prices and partially due to promotion of exports of other goods beside oil.

2. The proportion of merchandise exports out of GDP has also declined throughout the period in all members except for the UAE. This ratio has declined in Kuwait, Oman, and Saudi Arabia from around 55-70 per cent in 1970 to around 40-45 per cent in 1997. The decline in this ratio was also a direct result of the decline in oil revenues. The UAE active role as a major re-exporter stabilized the ratio of its merchandise exports to GDP to around 68 per cent.

3. The ratio of merchandise imports to GDP has averaged between 20 to 30 per cent throughout the period in all members except the UAE. In the UAE, this ratio increased throughout the period reaching around 54 per cent in 1997.

4. The ratio of merchandise imports to exports was subject to a high degree of fluctuations during the period. The ratio varied from 35 to 70 per cent in the cases of Kuwait and Saudi Arabia throughout the period. As for Oman, the ratio was very stable throughout the period (55-60 per cent). In contrast to all members, this ratio increased sharply in the UAE to reach 78 per cent in 1997. Thus, as oil export revenues declined during the 1980s, the ratio of imports to exports increased significantly in all members, except Oman.

5. The ratio of trade balance to GDP in the members of the GCC has fluctuated sharply with changes in the world price of oil. This ratio has declined in all members, except Oman, from 40-50 per cent in 1976 to around 15-20 per cent in 1997. The ratio of trade balance to GDP in Oman has been stable around 20 per cent throughout the period. It should be noted that Oman is not an OPEC member and therefore is not obliged to stick to a production quota. Saudi Arabia trade surplus declined sharply during the 1980s but improved in the 1990s as a result of stability in oil price and the increased in Saudi oil production. The UAE suffered the sharpest decline in this ratio.

6. All the members experienced a continuous deficit in the service balance (import and export of services) throughout the period. The outflows in services declined in the late 1980s, but rose sharply in the 1990s. The main reason for this reduction is the decline in investment expenditure due to the sharp decline in oil revenues. The outflows in services increased sharply after the 1990 Persian war due to high imports of military services.

7. The ratio of the resource balance to GDP declined from around 40 per cent in 1970 to around 10 per cent in 1997 in all members except Oman. In Oman, the ratio of resource balance to GDP was stable around 15 per cent.

8. The ratio of net investment income to GDP has varied among the GCC countries during the period. Kuwait had the highest ratio throughout the period (20-30 per cent). Oman's net investment income was constantly in deficit during the period. Most of Oman's investment was financed by external borrowing or through direct

foreign investment. Even the main oil company, Petroleum Development Oman (PDO) still has many foreign partners. The ratio of net investment income to GDP in Saudi Arabia declined sharply from 12 per cent in 1983 to 2 per cent in 1997. This ratio has increased in the UAE slightly from 5 per cent in 1983 to 10 per cent in 1997.

9. The net current transfers constituted a significant part of the GDP (5-10 per cent). Private and official transfer payments increased in all the members during the period, particularly in the 1990s. The GCC heavy dependence on expatriate labor accelerated private remittances abroad.

10. The decline in oil exports combined with deficit in the services balance and net current transfers depleted the gains from trade surplus in all members. This resulted in a continuous decline in the surplus on current account. The ratio of current account to GDP has varied extremely among the GCC countries during the period. In the case of Kuwait, this ratio averaged around 25-35 per cent for most of the period. The continuous surplus in net investment income prevented further deterioration in Kuwait balance of current account. The current account in Oman was in deficit since 1991. The ratio of current account to GDP has declined sharply from 6 per cent in 1983 to a deficit of –0.5 per cent in 1997. In Saudi Arabia, the current account was in deficit since 1983 despite the improvement in the trade balance during the 1990s. The current account recovered slowly in 1997 and was around $200 m. The ratio of current account to GDP has also declined sharply in the UAE, from 30 per cent in 1983 to 12 per cent in 1997.

11. The behavior of short and long-term capital during the period indicates that all members preferred to invest the surplus in the current account in short-term capital. This is probably due to the need to liquidate some of these assets on a short notice. The data show that while Saudi Arabia and Oman have reduced their long-term investment and increased the short-term investment, Kuwait and the UAE devoted a significant proportion of their surplus in the current account to long term-investment (around 10-20 per cent).

12. The expected fluctuations in oil prices induced members of the GCC to follow different path of investment in foreign capital. The oil sector has attracted large direct investment and other long-term capital over the period. Saudi Arabia viewed overseas investment as a temporary placement of surplus fund to be obtainable on requirement. Whereas Kuwait considered such investment as a way of diversifying the economy and developing new source of income. Saudi Arabia investment was concentrated mainly in liquid assets while Kuwait favored more direct investment in energy, real estate, and manufacturing. The UAE followed a combination of these two policies, while Oman invested mainly in its domestic oil sector. The GCC investment overseas was more than $300 bn between the years 1974 and 1985. However, the decline in oil revenues in the 1980s, the Iran–Iraq (1980-1988), and the Gulf war in 1990 have induced the GCC to reduce its foreign investment extremely. The GCC foreign investment was invested approximately in the following manner:

- Bank deposits in the industrialized countries constituted 28 per cent of foreign investment.
- Government securities in the USA, UK, and Germany accounted for 27 per cent.
- Foreign exchange reserves including gold, SDRs, reserves with the IMF accounted to 6 per cent of total investment.
- Equity holdings (corporate bonds and stocks), and other fixed investments constituted around 24 per cent of total.
- The remaining 15 per cent were loans to less developed countries (Azzam, 1986).

13. The item net error and omissions is extremely high in the case of Kuwait, particularly in the year 1983. This might indicate the inaccuracy in reporting the items in the (BoP).

14. Kuwaiti reserves declined sharply to just $7 m in 1997. Reserves in Oman and the UAE improved slightly between 1989 and 1997. Reserves in Saudi Arabia declined sharply in 1983 and 1989, but improved slightly in 1997.

Table 4.1: Kuwait Balance of Payments in Selected Years (million US$)

	1970	1976	1983	1989	1997
Merchandise Exports	1693	9621	11473	11396	14281
Oil Exports	1596	8953	10069	10432	13318
Merchandise Imports	625	3300	6889	6410	7747
Balance of Trade (BT)	1068	6321	4584	4986	6534
Service Balance	-43	-363	-2752	-2774	-3369
Resource Balance	1025	5958	1832	2212	3165
Net Income	3	1508	5029	8418	6277
Net Current Transfers	175	537	1551	1494	1507
Balance of Current Account (B.C.A)	853	6929	5310	9136	7935
Direct Investment, Long Term Capital	-	-756	-902	-994	989
Short Term Capital	-	-8643	364	-7329	-7295
Net Errors and Omissions	-	2070	-4432	462	-1621
Total Changes in Reserves	-	-247	-1002	-1275	-7
GDP	2873	13267	20870	24321	30207
Economic Indicators (%)					
Oil Exports to Merchandise Exports	94.3	93.1	87.8	91.5	93.3
Merchandise Exports to GDP	58.9	72.5	55.0	46.9	47.3
Merchandise Imports to GDP	21.8	24.9	33.0	26.4	25.6
Merchandise Imports to Exports	36.9	34.3	60.0	56.2	54.2
Balance of Trade to GDP	37.2	47.6	22.0	20.5	21.6
Resource Balance to GDP	35.7	44.9	8.8	9.1	10.5
Net Transfers to GDP	6.1	4.0	7.4	6.1	5.0
Net Income to GDP	0.1	11.4	24.1	34.6	20.8
Current Account to GDP	29.7	52.2	25.4	37.6	26.3

Sources: International Financial Statistics Yearbook, 1998. IMF, Balance of Payments Statistics (IMF, different issues).

Note: The financial account entries are made on net basis (credit or debit). Increases in financial assets and decreases in liabilities are shown as debits. The opposite is true for credits.

Table 4.2: Oman Balance of Payments in Selected Years (million $US).

	1970	1976	1983	1989	1997
Merchandise Exports	-	1596	4256	4068	7631
Oil Exports	-	1129	4201	3502	5783
Merchandise Imports	-	1000	2360	2225	4649
Balance of Trade (BT)	-	596	1896	1843	2982
Service Balance	-	-177	-674	-511	-1148
Resource Balance	-	419	1222	1332	1834
Net Income	-	-214	-183	-250	-460
Net Current Transfers	-	-168	-544	-775	-1431
Balance of Current Account (B.C.A)	-	37	495	307	-57
Direct Investment, Long Term Capital	-	81	155	112	49
Short Term Capital	-	157	171	-127	505
Net Errors and Omissions	-	308	-466	33	34
Total Changes in Reserves	-	-57	-351	-324	-531
GDP	-	2560	7935	8402	15799
Economic Indicators (%)					
Oil Exports to Merchandise Exports	-	70.7	98.7	86.1	75.8
Merchandise Exports to GDP	-	62.3	53.6	48.4	48.3
Merchandise Imports to GDP	-	39.1	29.7	26.5	29.4
Merchandise Imports to Exports	-	62.7	55.5	54.7	60.9
Balance of Trade to GDP	-	23.3	23.9	21.9	18.9
Resource Balance to GDP	-	16.4	15.4	15.9	11.6
Net Transfers to GDP	-	-6.6	-6.9	-9.2	-9.1
Net Income to GDP	-	-8.4	-2.3	-3.0	-2.9
Current Account to GDP	-	1.4	6.2	3.7	-0.4
Sources: As for Table 4.1					

Table 4.3: Saudi Arabia Balance of Payments in Selected Years (million $US)

	1970	1976	1983	1989	1997
Merchandise Exports	2089	35632	45864	28385	60731
Oil Exports	2418	38157	44830	24095	49410
Merchandise Imports	829	10385	33218	19231	26370
Balance of Trade (BT)	1260	25247	12646	9154	34361
Service Balance	-91	-6179	-33108	-17364	-21822
Resource Balance	1169	19068	-20462	-8210	12540
Net Income	-834	-396	12846	9416	3156
Net Current Transfers	-264	-4312	-9237	-10742	-15439
Balance of Current Account (B.C.A)	71	14360	-16853	-9536	257
Direct Investment, Long Term Capital	-	-397	4944	-654	2575
Short Term Capital	-	-10236	10399	6684	-2180
Net Errors and Omissions	-	-	-	-	-
Total Changes in Reserves	-87	-3341	1509	3508	-652
GDP	3867	58091	107682	82996	146500
Economic Indicators (%)					
Oil Exports to Merchandise Exports	115.7	107.1	97.7	84.9	81.4
Merchandise Exports to GDP	54.0	61.3	42.6	34.2	41.4
Merchandise Imports to GDP	21.4	17.9	30.8	23.2	18.0
Merchandise Imports to Exports	39.7	29.1	72.4	67.8	43.5
Balance of Trade to GDP	32.6	43.5	11.7	11.0	23.4
Resource Balance to GDP	30.2	32.8	-19.0	-9.9	8.5
Net Transfers to GDP	-6.8	-7.4	-8.6	-12.9	-10.5
Net Income to GDP	-21.6	-0.7	11.9	11.3	2.1
Current Account to GDP	1.8	24.7	-15.7	-11.5	1.8
Source: As for Table 1					

Table 4.4: United Arab Emirates Balance of Payments in Selected Years (million $US)

	1970	1976	1983	1989	1997
Merchandise Exports	520	9130	15400	15391	33982
Oil Exports	485	8384	13016	10215	13375
Merchandise Imports	270	2810	7200	9017	26603
Balance of Trade (BT)	250	6320	8200	6374	7379
Service Balance	-	-810	-2400	-2193	-2451
Resource Balance	-	5510	5800	4181	4929
Net Income	-	130	1500	1430	4765
Net Current Transfers	-10	-1770	-2000	-1580	-3404
Balance of Current Account (B.C.A)	90	3870	5300	4031	6290
Direct Investment, Long Term Capital (KL)	-	-160	-1500	-1000	54
Short Term Capital (KS)	-60	-1210	-4200	-1642	-4344
Net Errors and Omissions	-	-	-	-	-
Total Changes in Reserves (R)	-30	-2500	400	-1389	-2000
GDP	746	12926	28030	27267	49334
Economic Indicators (%)					
Oil Exports to Merchandise Exports	93.3	91.8	84.5	66.4	39.4
Merchandise Exports to GDP	69.7	70.6	54.9	56.4	68.9
Merchandise Imports to GDP	36.2	21.7	25.7	33.1	53.9
Merchandise Imports to Exports	51.9	30.8	46.8	58.6	78.3
Balance of Trade to GDP	33.5	48.9	29.3	23.4	15.0
Resource Balance to GDP	-	42.6	20.7	15.3	10.0
Net Transfers to GDP	-1.3	-13.7	-7.1	-5.8	-6.9
Net Income to GDP	-	1.0	5.4	5.2	9.7
Current Account to GDP	12.1	29.9	18.9	14.8	12.7
Source: As for Table 1.					

4.4 The Impact of Fluctuations in Oil Prices on the Performance of the Balance of Payments in the GCC Countries

Table 4.5 presents the growth rates of merchandise exports and imports and the average surplus or deficit in the trade balance and current account for the GCC members during four sub-periods. The years 1990 and 1991 were excluded in the case of Kuwait due to the Iraqi invasion. It can be seen that all members enjoyed high growth rates in merchandise exports and imports in the first sub-period (1967-73). The high growth was a result of the rise in the volume of oil exports and not in oil prices. During the second sub-period (1974-82), all members also enjoyed high growth rates of merchandise exports and imports. However, the high growth in this period reflected the rise in both the volume of oil exports and oil prices. Kuwait has the lowest rate of growth in merchandise exports during this sub-period (6.71 per cent). This was probably due to the government decision to conserve on its sole natural resource. The statistical results in the third sub-period (1983-89) suggest that growth was not significant. The growth rates of merchandise exports and imports in the fourth sub-period (1990-1997) were significant in the case of the UAE only.

The average surplus in the trade balance and current account for all members increased significantly during the second sub-period, particularly in the case of Saudi Arabia. However, these surpluses declined sharply in the third sub-period as a result of the downturn in oil prices. The effect of this decline was more severe on Saudi Arabia, whose surplus in the current account was turned into deficit during this sub-period. The average trade surplus improved in the fourth sub-period (1990-97), particularly in Saudi Arabia. But the deficit in both Oman and Saudi Arabia current accounts continued to

deteriorate. The average surplus in the current account has increased only in the case of the UAE.

Table 4.5: The Growth Rate and Economic Indicators of the Components of the GCC Balance of Payments (1967-97) [A,B]

		1967-1973	1974-1982	1983-1989	1990-1997
Kuwait	Export of Goods	14.69*	6.71*	-4.15	7.47
	Import of Goods	7.52*	18.36*	-1.93	2.12
	Average Surplus/Deficit in Trade Balance	1443	7996	3825	4402
	Average Surplus/Deficit in Current Account	1135	8890	5779	4222
Oman	Export of Goods	-	18.04*	-3.43	3.65**
	Import of Goods	-	17.14*	-4.16	4.24
	Average Surplus/Deficit in Trade Balance	-	1109	1612	2213
	Average Surplus/Deficit in Current Account	-	413	75	-346
Saudi Arabia	Export of Goods	24.96*	16.84*	-8.89	1.37
	Import of Goods	14.71*	26.73*	-8.85**	1.11
	Average Surplus/Deficit in Trade Balance	2027	38817	7216	24585
	Average Surplus/Deficit in Current Account	796	17829	-12376	-10198
U.A.E	Export of Goods	43.11*	15.44*	-2.54	5.16*
	Import of Goods	34.21*	21.11*	4.42	11.91*
	Average Surplus/Deficit in Trade Balance	680	8519	6925	8190
	Average Surplus/Deficit in Current Account	250	5388	4647	6449

A: * and ** indicate significance level at the 5 and 10 per cent respectively.
B: Average surplus/deficit in trade balance and current account is in million US$.

4.5 Conclusions

The main conclusions of this chapter may be summarized in the following:

1. The proportion of oil exports out of merchandise exports has been declining gradually in all the members except Kuwait.

2. The proportion of merchandise exports out of GDP has also declined throughout the period in all members except for the UAE.

3. The ratio of merchandise imports to GDP has averaged between 20 to 30 per cent throughout the period in all members except the UAE.

4. The ratio of merchandise imports to exports fluctuated sharply in all members, Oman was the only exception.

5. The ratio of trade balance to GDP in the members of the GCC has fluctuated sharply with changes in the world price of oil.

6. All the members experienced a continuous deficit in the service balance (import and export of services) throughout the period.

7. The deficit in net current transfers constituted a significant part of the GDP (5-10 per cent).

8. The decline in oil exports combined with deficit in the services balance and net current transfers depleted the gains from trade surplus in all members. This resulted in a continuous decline in the surplus on current account.

9. The expected fluctuations in oil prices induced members of the GCC to follow different path of investment in foreign capital. The oil sector has attracted large direct investment and other long-term capital over the period.

Chapter Five

The Long-Run Relationship Between Imports and Oil Exports: Cointegration Analysis

5.1 Introduction

Policy makers are very concerned with maintaining a trade surplus or reducing the trade deficit. This issue becomes more important to the GCC economies because of the downturn in oil prices and the consequent deterioration in their terms of trade. As a result, some GCC countries experienced periods of trade deficit since 1986. The study of the long-run relationship between oil exports and foreign imports is very important in order to evaluate the effectiveness of the macro economic policies. The main question to be answered is whether oil exports and imports of each GCC member converge towards a long-run equilibrium given the fluctuation in oil prices.

New developments in econometrics helped study the long-term relationship between imports and exports. Appendix 1 presents a brief reviews of these developments and in particular the concept of cointegration, stationarity of data, unit root tests, and error correction mechanisms (ECM). Granger (1986) listed imports and exports among the variables to which cointegration analysis could be applied. Husted (1992) examined the long-run relation between the U.S. imports and exports, using Engle and Granger method. Husted found no simple cointegration between the two variables, but when a dummy variable was included in the model to capture the 1983 structural change in the U.S. economy, he found an evidence of cointegration between imports and exports in the U.S.

Bahmani-Oskooee (1994) applied the Granger method on Australia's imports and exports. He found a strong evidence of cointegration between the two variables and that the cointegration coefficient is close to unity. Bahmani-Oskooee (1995) applied both Engle-Granger method and the Johansen-Juselius cointegrated approach to Iran imports and exports. He found an evidence of cointegration when the nominal (current) values of imports and exports were used and not the real (constant) values.

This chapter applies the Engle-Granger method and the Johansen-Juselius approach to cointegration in examining the long-run relationship between oil exports and aggregate imports in Kuwait, Oman, Saudi Arabia, and the UAE, using annual data over the 1967-1996. The chapter is divided into five sections. Section two examines the results of the Augmented Dickey-Fuller and Phillips-Perron unit root tests. Section three analyzes the results of Engle-Granger method of cointegration. Section four examines the results of the Johansen-Juselius method of cointegration. Finally, section five summarizes the main conclusions.

5.2 The Augmented Dickey-Fuller and Phillips-Perron Unit Root Tests

To establish the existence or non-existence of an equilibrium relationship between imports and oil exports, we must first test whether the two variables are integrated to the same order. The Augmented Dickey-Fuller test (ADF) and Phillips-Perron (PP) test described in appendix one are employed to test whether the two time series are stationary.

The Augmented Dickey-Fuller (ADF) equation were estimated as follows:

$$\Delta X_t = \alpha_0 + \beta_0 X_{t-1} + \sum_{i=1}^{n} P_i \Delta X_{t-i} + \delta time + e_t \qquad (5.1)$$

This test is the most comprehensive test statistic with the test equation having both a constant term and trend term together with the autoregressive terms. The F-test is calculated for B_0 under the null hypotheses ($H_0 : B_0 = \alpha_0 = \delta_0 = 0$).

The Phillips-Perron test is an alternative test for a unit root. The PP test is used for non-parametric correction for serial correction. Similar to the ADF test, the PP test is a test of the hypothesis $\rho = 1$ in the equation

$$\Delta Y_t = \mu + \rho Y_{t-1} + \varepsilon_t \qquad (5.2)$$

Unlike the ADF test, there are no lagged difference terms. Instead, the equation is estimated by OLS, with the optional inclusion of constant and time trends. The *t*-statistic of the coefficient is then corrected for serial correlation in *t*. The Newey and West (1987) method is used to construct a weighted estimate of the error variance from the estimated residuals ε_t as:

$$\frac{1}{N}\sum_{t=1}^{N} \hat{\varepsilon}_t^2 + \frac{2}{N}\sum_{s=1}^{l} \omega(s,l) \sum_{t=s+1}^{N} \hat{\varepsilon}_t \hat{\varepsilon}_{t-1} \qquad (5.3)$$

Where l is truncation lag parameter and

$$\omega(s,l) = \frac{(1-s)}{(l+1)}$$

Table 5.1 displays the ADF and the PP unit root tests results for the imports and oil exports time series in the four GCC countries. It is clear from table 5.1 that in the case of Kuwait, Oman, and Saudi Arabia the calculated ADF statistic and the PP statistic are greater than the critical value only for the first differenced variables. The results indicate that the variables are non-stationary at levels and have achieved stationarity after being differenced once. Thus, both imports and oil exports in Kuwait, Oman, and Saudi Arabia are integrated of order one, I (1). On the other hand, both variables in the case of the UAE did not achieve stationarity after first differencing. A second differencing was required to insure stationarity (integrated of second order, I (2)). Because both variables in each GCC member are integrated to the same order, the cointegration analysis will be very practical. Therefore, the Engle-Granger method and Johansen-Juselius approach to cointegration between aggregate imports and oil exports will be applied to four GCC members.

Table 5.1: Estimation Results of Unit Root Tests for Kuwait, Oman, Saudi Arabia, and United Arab Emirates

(Kuwait)

Variable	ADF Test Statistic			PP Test Statistic		
	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-1.749	-3.602	3	-1.980	-3.579	3
Δ Oil Exports	-4.782	-3.594	1	-4.607	-3.586	3
Imports	-1.613	-3.602	3	-1.584	-3.579	3
Δ Imports	-4.302	-3.594	1	-4.499	-3.586	3

(Oman)

Variable	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-2.663	-3.602	3	-2.782	-3.579	3
Δ Oil Exports	-6.811	-3.594	1	-6.747	-3.586	3
Imports	-3.385	-3.602	3	-2.409	-3.579	3
Δ Imports	-3.796	-3.594	1	-3.967	-3.586	3

(Saudi Arabia)

Variable	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-2.085	-3.602	3	-1.828	-3.579	3
Δ Oil Exports	-3.945	-3.594	1	-3.756	-3.586	3
Imports	-2.239	-3.602	3	-1.486	-3.579	3
Δ Imports	-3.619	-3.594	1	-3.623	-3.586	3

(United Arab Emirates)

Variable	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-1.904	-3.602	3	-1.726	-3.579	3
Δ Oil Exports	-3.375	-3.594	1	-3.502	-3.586	3
Δ^2 Oil Exports	-4.760	-3.602	1	-6.238	-3.595	3
Imports	-1.623	-3.602	3	-1.501	-3.579	3
Δ Imports	-1.993	-3.594	1	-2.233	-3.586	
Δ^2 Imports	-3.857	-3.602	1	-3.765	-3.595	3

The null hypothesis is each variable is integrated of order 1 I(1), the 5% critical values are given in parenthesis and derived from E-views econometric package. Δ denotes the first difference of a variable while Δ^2 denotes its second difference.

5.2.1 Plots of the Oil Exports and Imports in the GCC Members

Before presenting the cointegration results, it may be useful to examine the relation imports and oil exports variables in the four GCC members graphically. This is done in Figures 5.1 to 5.4. The graph of Kuwait (Figure 5.1) does not show that the variables follow each other very well. The variation in exports is greater than the variation in imports throughout the period. Furthermore, there is a structural change in the variables after the year 1990 due to the Iraqi invasion of Kuwait. From figure 5.2, it is clear that in the case of Oman the two variables follow each other very well. In the case of Saudi Arabia (Figure 5.3), the variation in oil exports was more substantial than variation imports during the period 1967-82. But after 1982, the two variables were moving together more closely; suggesting a long run relationship between them. In contrast to Saudi Arabia, United Arab Emirates imports and oil exports (Figure 5.4), were moving together more closely prior to 1982. But after 1982 the tow variables moved separately from each other to the point that imports surpassed oil exports since 1990. This result is unique to the UAE only, because for the remaining GCC members oil exports was greater than imports throughout the period. To summarize, we can assume from the four plots that imports and oil exports are more likely to be cointegrated in the case of Oman and Saudi Arabia rather than Kuwait and United Arab Emirates. In order to validate such assumption, we will apply the Engle-Granger method first as a test for cointegration.

Figure 5.1: Kuwait Oil Exports and Imports (Million $US)

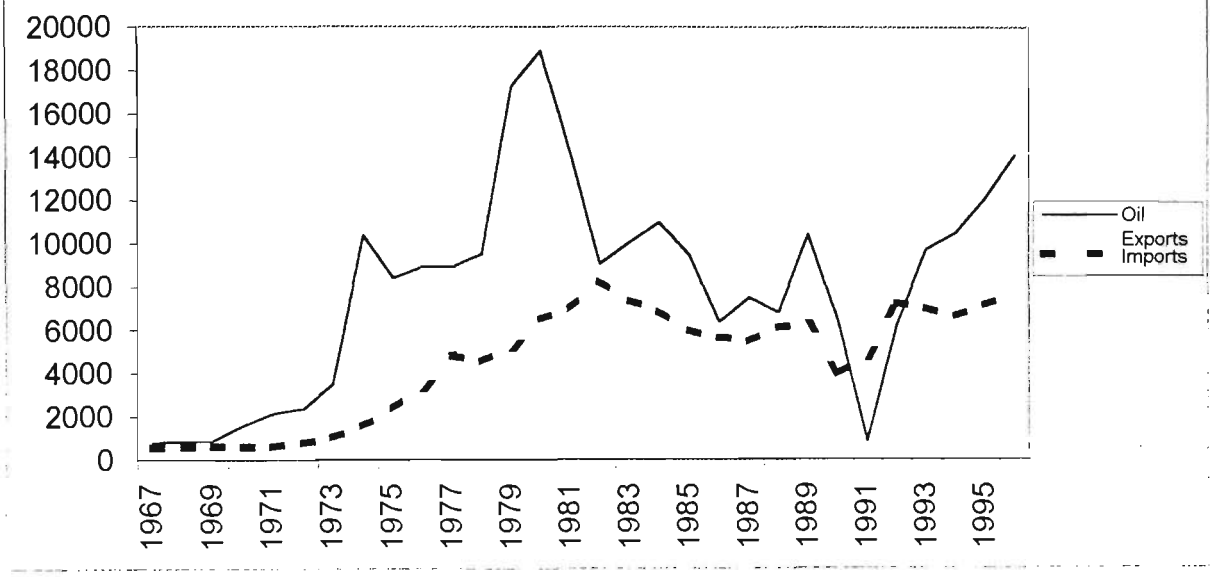


Figure 5.2: Oman Oil Exports and Imports (Million $US)

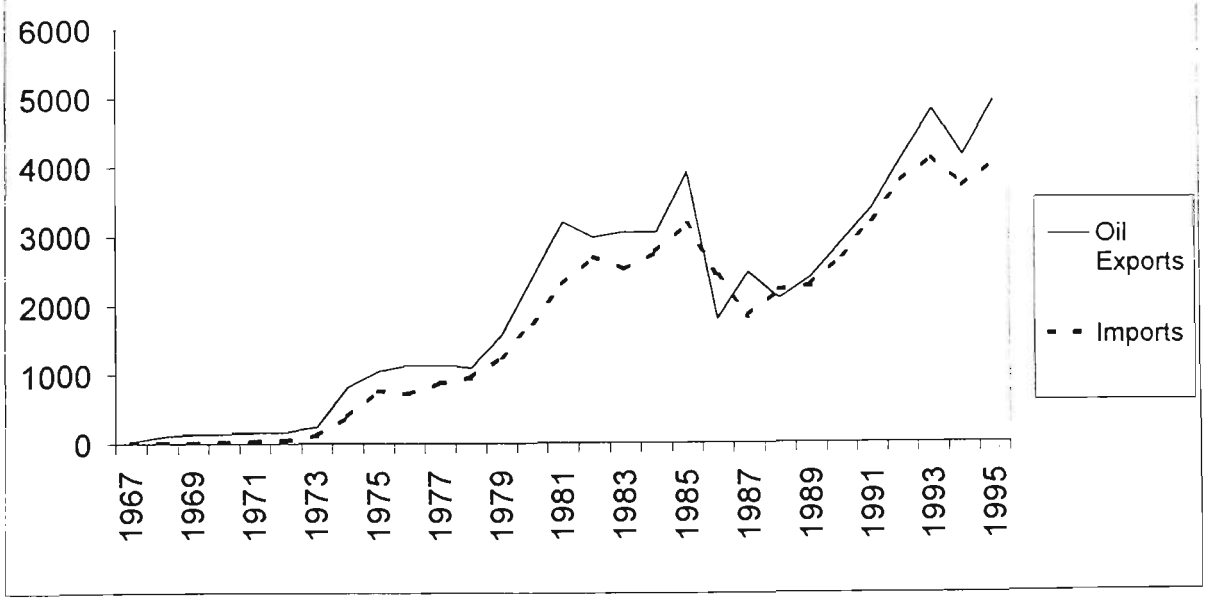


Figure5.3: Saudi Arabia Oil Exports and Imports
(Million $US)

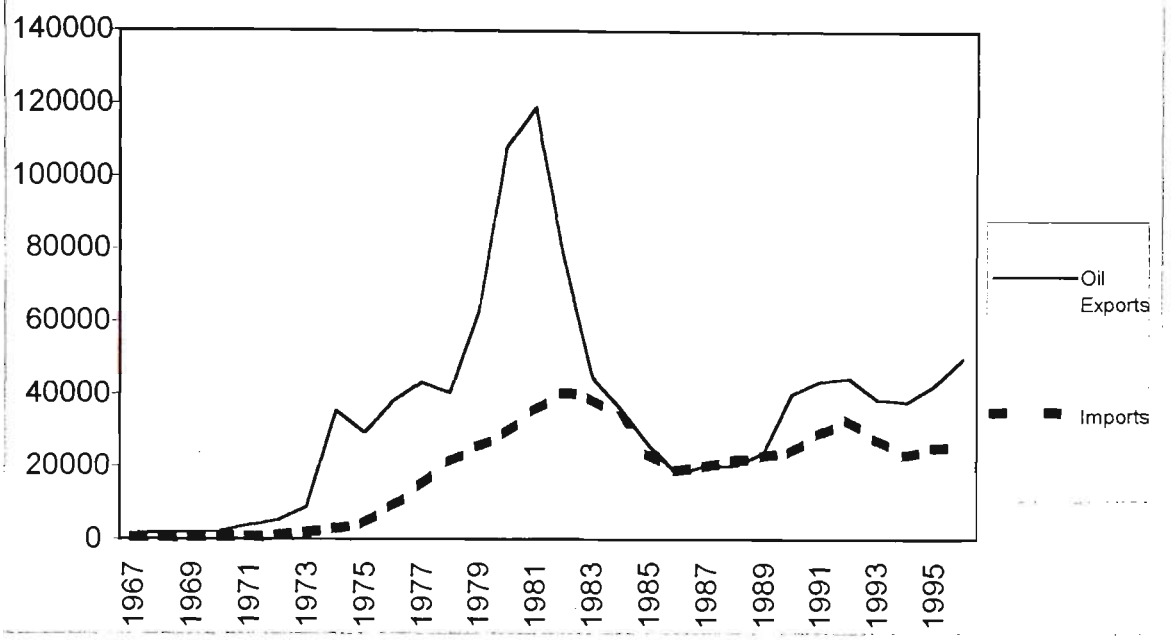
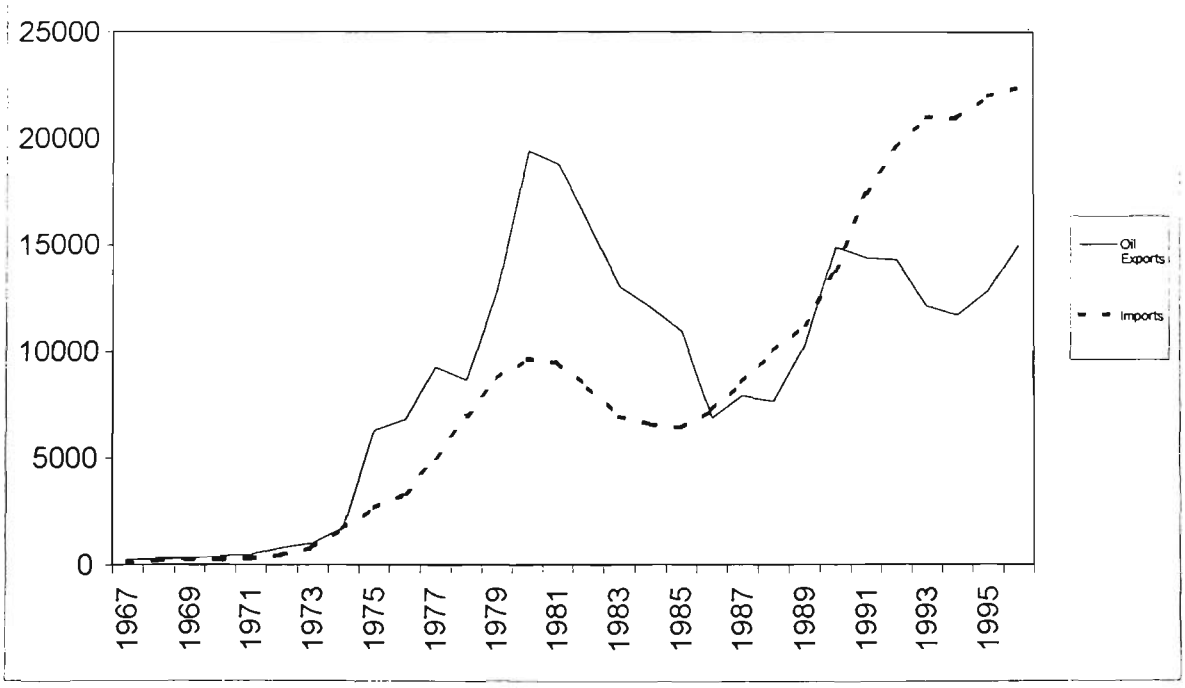


Figure5.4: The UAE Oil Exports and Imports
(Million $US)



5.3 Engle-Granger Test for Cointegration

The most widely used method of applying cointegration analysis is based on Engle and Granger (1987) approach. As indicated in appendix one, this approach suggests if a set of time series are I(1) and the linear combination of these variables are I(0), then these time series are said to be cointegrated. In order to determine if a cointegrating relationship exists, a cointegration regression is estimated by regressing the log of oil exports on the log of imports (and vice versa) by OLSQ method and testing for the stationarity of the residuals using the ADF test

Table 5.2 presents the results of the Engle-Granger method. Two forms of regression were estimated in the case of Kuwait, one has no dummy, whereas the other one includes a dummy variable to capture the structural change after 1990. The inclusion of a dummy variable did not improve the results. Furthermore, a trend variable was also included in all the regression, no improvement in the results was achieved either.

It can be seen from Table 5.2 that the ADF of the residuals are greater than their critical values in all the regressions except for Oman. In this case, the ADF of the residuals are less than the critical values and the slope coefficient (1.3) is close to unity. Oman ADF test results suggest that its imports and oil exports are cointegrated. The suggestion is consistent with the graph shown in figure 5.2.

Table 5.2 The Engle-Granger Cointegration Results

(Kuwait)

Equation	Constant	slope	R^2	ADF	95% C.V
log(M)=f(log(X)	1.344	0.780	0.61	-1.338 [2][a]	-3.58
	(1.289)[b]	(6.507)			
log(X)=f(log(M)	2.314	0.712	0.61	-2.277 [2]	-3.58
	(2.362)	(6.507)			

(Oman)

Equation	Constant	slope	R^2	ADF	95% C.V
log(M)=f(log(X)	-3.238	1.387	0.95	-4.598 [2][a]	-3.58
	-(7.574)[b]	(23.25)			
log(X)=f(log(M)	2.558	0.687	0.95	-4.105 [2]	-3.58
	(12.2)	(23.25)			

(Saudi Arabia)

Equation	Constant	slope	R^2	ADF	95% C.V
log(M)=f(log(X)	-2.004	1.119	0.82	-1.490 [2][a]	-3.58
	-(1.952)[b]	(10.953)			
log(X)=f(log(M)	3.295	0.729	0.82	-2.203 [2][a]	-3.58
	(5.329)	(10.953)			

(United Arab Emirates)

Equation	Constant	slope	R^2	ADF	95% C.V
log(M)=f(log(X)	-0.513	1.035	0.93	-0.815 [2][a]	-3.58
	-(1.076)[b]	(18.674)			
log(X)=f(log(M)	1.069	0.897	0.93	-1.255 [2]	-3.58
	(2.649)	(18.674)			

a. Number inside the brackets is the number of lags in the ADF test of residuals.
b. Number inside the parenthesis is the value of *t*-statistic.

5.4 The Johansen-Juselius Cointegration Method

Tests of the long-run relationship between economic variables using the Engle-Granger approach suffer from a major deficiency, in which the estimated cointegrating relationship may not be invariant depending on which variable is used on the left hand side. In this respect, the multivariate cointegration technique proposed by Johansen (1988) or Johansen and Juselius (1990) is superior to the Engle-Granger approach as it fully captures the underlying time series properties of the data. The Johansen and Juselius method depends on the calculation of Maxiaml eigen-value (λ-*max*) and *trace* statistics using maximum likelihood estimation procedure to identify the number of cointegrating vectors. To carry out the test we proceed sequentially by first testing for H_0: r <= 0, where r is the number of cointegrating vectors. If H_0 was rejected, we then test for r<=1 and so on, until the null hypothesis could not be rejected. The *trace* test provides a test of the null hypothesis $H_0 : r \leq r_0$ against the alternative $H_a : r > r_0$, where r refers to the number of cointegrating vectors. The maximal eigen value test concerns a test of $H_0 : r = r_0$ against $H_a : r = r_0 + 1$. Johansen and Juselius (1990) suggest that the maximal eigen-value test has greater power than the trace test, but both tests will be reported for consistency

Prior to the application of the Johansen method, the order of the VAR (Vector-Auto-Regressive) error correction model must be determined. According to the test statistics and choice criteria for selecting the order of the VAR model, the Schwarz Bayesian Criterion (SBC) suggests a VAR of order 1, the Akaike Information Criterion (AIC) of order 2. Due to the limited number of observations it is appropriate to choose an order of 2 or less. To determine the sensitivity of the results to the choice of lag order, lag of orders 1 and 2 will be reported in each case. The statistical package (MFIT

4.0) offers five options in applying the Johansen's method. The options correspond to different specification of intercept and trend variable in the underlying VAR model. The options are as follows:

1. No intercept or trends included in the VAR model
2. Restricted intercept, and no trends in the VAR model
3. Unrestricted intercept, and no trends in the VAR model
4. Unrestricted intercept, and restricted trends in the VAR model
5. Unrestricted intercept, and unrestricted trends in the VAR model

Option 1 assumes that there are no deterministic trends in the variables and the underlying data generating process (DGP) does not contain a trend term either. Option 2 is appropriate when the jointly determined variables do not contain a deterministic trend. Option 4 is appropriate when the jointly determined variables in the VAR have a linear deterministic trend. Option 3 and 5 can lead to error correction models with different trend properties depending on the number of cointegrating relations. In the case of the cointegrating VAR option, the choice of intercepts and trends is very important in testing for cointegration. In regard to the GCC imports and oil exports, although the underlying variables are trended, they move together, and it seems unlikely that there will be a trend in the cointegrating relations. The Johansen method will be applied to the variables using option 1, 3, and 4. Tables 5.3 and 5.4 report the results of λ-*max* and *trace* statistics for all three cases.

5.4.1 The Johansen-Juselius Maximal Eigen-value and *Trace* Test Results

The Kuwaiti results are reported in Table 5.3. As can be seen the null hypothesis of no cointegration can be rejected in some cases. Those cases where the maximal eigen-value and trace statistics are larger than their 5 per cent and 10 per cent critical values, are identified by an (*) and (**) signs respectively. The results are very sensitive to the choice of lags in the VAR. In case one, the null of r=0 is rejected by both tests when one and two lags are used. Nevertheless, the null of at most one cointegrating vector cannot be rejected, indicating that there is at most one cointegrating vector between Kuwait oil exports and imports. In cases two and three, the evidence of one cointegrating vector can be found by both tests, but with two lags only. As was mentioned previously, The maximal eigen-value statistic is more reliable than the trace statistic and the choice of one lag is more appropriate for the limited observation in this study. Therefore, according to the above two criteria the evidence of at most one cointegrating vector is very weak (only in case one with 10 per cent significance level). Thus, according to the Engle-Granger approach and Johansen-Juselius method of cointegration, there is no evidence of long-run relation between Kuwait imports and oil exports

In the case of Oman, the results in Table 5.3 suggest that the null hypothesis of no cointegration can be rejected by both the maximal eigen-value and trace tests in all cases. The null hypothesis of at most one cointegrating vector cannot be rejected by both tests with one lag, indicating the existence of a unique cointegrating vector in all the three cases. The results clearly indicate that the log of oil exports and log of imports are cointegrated in the long-run. When one lag is used in the VAR, the normalized cointegrating coefficient in the three cases were 1.11, 1.07, and 1.30 respectively. For

the slope coefficient to be close to unity is a strong indication of cointegration between imports and oil exports in Oman. Thus, the Johansen-Juselius method of cointegration emphasizes both the Engle-Granger cointegration results and the assumption made from Figure 5.2 that imports and oil exports are cointegrated in the long-run.

Saudi Arabia cointegration results are similar to Oman as can be seen from Table 5.4. Both the maximal eigen-value and trace statistics confirm the existence of one cointegrating vector when one lag is used. Furthermore, when two lags are used in the VAR, the evidence of cointegration can be found in case one according to the maximal eigen value and case two according the *trace* statistic. When one lag is used in the VAR, the normalized cointegrating coefficient in the three cases were 1.02, 0.91, and 0.98 respectively. As in the case of Oman, for the slope coefficient to be close to one is a strong evidence of cointegration between Saudi Arabia imports and oil exports.

United Arab Emirates results in Table 5.4 show that the null hypothesis of r=0 can be rejected in cases one and three. When one lag is used in the VAR, both tests confirm the existence of a unique cointegrating vector in the above two cases. The UAE data is very sensitive to the choice of lag. When two lags are used in the VAR, no evidence of cointegration was found. The normalized cointegrating coefficient in cases one and three were 0.86 and 1.32 respectively, indicating a long run equilibrium.

To summarize, applying the Johansen-Juselius cointegration method between the GCC oil exports and imports, a strong evidence of cointegration between the two variables was only found in the cases of Oman, Saudi Arabia and United Arab Emirates. No unique cointegrating seems to exist in the case of Kuwait.

5.5 Conclusions

This chapter examined the long run relationship between oil exports and imports in Kuwait, Oman, Saudi Arabia, and the United Arab Emirates over the period 1967-1996. The Engle-Granger approach and Johansen-Juselius method of cointegration analysis were implemented. The Engle-Granger cointegration approach revealed no evidence of cointegration between oil exports and imports in the members of the GCC, except Oman. But when the superior Johansen-Juselius method was used, there was a strong evidence of long-run relation between imports and oil exports in three members of the GCC (Oman, Saudi Arabia, and United Arab Emirates). Kuwait is the only country, which both methods failed to recognize a unique cointegrating vector. On the other hand, both methods confirmed the cointegration between Oman oil exports and imports.

The slope coefficients in the Johansen-Juselius regression equations were close to unity in the cases of Oman, Saudi Arabia, and United Arab Emirates. This suggests that the long-run trade balance between imports and oil exports will be in equilibrium. Furthermore, the cointegration results suggest that the above three members macroeconomic policies were effective in sustaining long-run equilibrium between oil exports and imports. In contrast, the evidence of no cointegration between imports and exports in Kuwait indicate the lack of proper macroeconomic policies.

Table 5.3: Kuwait and Oman Johansen-Juselius Cointegration Results

(Kuwait)

Hypothesis		Maximal Eigen value			TRACE		
Null	**Alternative**	**1-LAG**	**2-LAG**	**95% C.V**	**1-LAG**	**2-LAG**	**95% C.V**
1 Non Trended Case							
r=0	r=1	10.89**	15.14*	11.03	13.60*	15.53*	12.36
R<=1	r=2	2.72	0.38	4.16	2.72	0.38	4.16
2 Trended Case, No Trend in VAR							
r=0	r=1	10.24	15.10*	14.88	13.75	21.09*	17.86
R<=1	r=2	3.52	5.98	8.07	3.52	5.98	8.07
3 Trended Case With Trend in VAR							
r=0	r=1	12.28	17.80**	19.22	15.81	25.48**	25.77
R<=1	r=2	3.53	7.67	12.39	3.53	7.67	12.39

(Oman)

Null	**Alternative**	**1-LAG**	**2-LAG**	**95% C.V**	**1-LAG**	**2-LAG**	**95% C.V**
1 Non Trended Case							
r=0	r=1	17.59*	10.01	11.03	17.87*	10.46**	12.36
R<=1	r=2	0.28	0.46	4.16	0.28	0.46	4.16
2 Trended Case, No Trend in VAR							
r=0	r=1	33.43*	12.89	14.88	41.19*	21.43**	17.86
R<=1	r=2	7.75	7.85	8.07	7.75	7.85	8.07
3 Trended Case With Trend in VAR							
R=0	r=1	36.55*	16.32	19.22	45.11*	24.86**	25.77
R<=1	r=2	8.55	8.93	12.39	8.55	8.93	12.39

a: * indicates significance at the 5% level.
b: ** indicates significance at the 10% level.

Table 5.4: Saudi Arabia and UAE Johansen-Juselius Cointegration Results

(Saudi Arabia)

Hypothesis		Maximal Eigen value			TRACE		
Null	Alternative	1-LAG	2-LAG	95% C.V	1-LAG	2-LAG	95% C.V
1 Non Trended Case							
r=0	r=1	31.57*	11.60*	11.03	31.69*	11.69**	12.36
r<=1	r=2	0.04	0.02	4.16	0.04	0.02	4.16
2 Trended Case, No Trend in VAR							
r=0	r=1	25.92*	12.09	14.88	32.12*	18.74*	17.86
r<=1	r=2	6.20	6.65	8.07	6.20	6.65	8.07
3 Trended Case With Trend in VAR							
r=0	r=1	26.49*	13.24	19.22	32.81*	20.90	25.77
r<=1	r=2	6.32	7.69	12.39	6.32	7.69	12.39

(United Arab Emirates)

Null	Alternative	1-LAG	2-LAG	95% C.V	1-LAG	2-LAG	95% C.V
1 Non Trended Case							
r=0	r=1	11.67*	3.54	11.03	12.82*	3.64	12.36
r<=1	r=2	1.14	0.12	4.16	1.14	0.12	4.16
2 Trended Case, No Trend in VAR							
r=0	r=1	9.62	4.34	14.88	11.53	5.87	17.86
r<=1	r=2	1.78	1.52	8.07	1.78	1.52	8.07
3 Trended Case With Trend in VAR							
r=0	r=1	20.32*	18.19**	19.22	26.24*	22.52	25.77
r<=1	r=2	5.91	4.33	12.39	5.91	4.33	12.39

a: * indicates significance at the 5% level.
b: ** indicates significance at the 10% level.

Chapter Six

Determinants of the GCC Aggregate Imports

6.1 Introduction

The purpose of this chapter is to analyze the determinants of aggregate imports of four GCC members, for which data are available. These members are: Oman, Kuwait, Saudi Arabia, and United Arab Emirates. The analysis uses the Johansen multivariate approach to cointegration and covers the period 1967-96. The long-run relationship between aggregate imports and the expenditures of macro components will be examined. A short-run error correction model will be developed and tested to estimate the short-run partial elasticities.

This chapter is structured according to the following sections: Section two reviews the relevant literature related to the imports demand function. Section three outlines the model and discusses the data used in the study. Section four examines the empirical results and their implications. Section five presents a short-run error correction model. Finally, section six summarizes the main conclusions and offers some recommendations.

6.2 Review of Literature

Many econometric studies concentrated on estimating the import demand function in general and the various elasticities of demand for aggregate imports, with special reference to specific countries. The simplest form of aggregate demand

function relates the quantity of imports demanded to real income and price variables, where income and quantity demanded are assumed to be positively related while price and quantity demanded are assumed to be inversely related, Houthakker and Magee (1969) and Khan (1975).

Some studies applied dynamic forms of import function such as the partial adjustment model. These models were desirable because the significant partial adjustment coefficient measures the length of the adjustment period and the ability to estimate the long-run elasticity. The partial adjustment model was used by Khan (1974), in a study of import and export demand in developing countries. The availability of import data by commodity (SITC) has encouraged more research to investigate different categories of imports. Kaman and Ironmonoger (1970), examined Australia's import function according to four groups namely; food, raw material, fuels, and manufactured products. Different explanatory variables were used for each group. Nguyen and Bhuyan (1977) followed the same framework.

To avoid specification bias, many studies focused on examining the appropriate functional form and the appropriate explanatory variables to include. Examples of such studies are those by Khan and Ross (1977), who examined the aggregate import equations of three major trading countries; the United States, Canada, and Japan (1960-72). The authors recommended the log-linear form because of the assumption of constant elasticities. Boylan and others (1980), also recommended the log linear form in their examination of the economies of Belgium, Denmark, and Ireland. Gandolofo and Petit (1983) and Giovannetti (1989) did more research in this direction. Arize and Afifi (1986) examined the simultaneous

relationship between the quantity of imports and their price. The simultaneous equations model results indicated that imports' volumes respond to changes in imports relative prices. Furthermore, consumers tended to respond more to changes in the price of domestic goods than to equal changes in import prices.

In regard to studies related to the Middle East, the log-linear functional form was followed by others such as Assery and Perdikis (1991) and Al-Yousif (1997). Assery and Perdikis (1993) used Box and Cox analysis of transformation to choose appropriate import demand function for the GCC. The linear model was found to be appropriate in the case of Kuwait and Oman only. While the log-linear model proved to fit Saudi Arabia, United Arab Emirates, and Qatar. In a study of the determinants of aggregate expenditures of the member states of the GCC, Metwally and Abdel-Rahman (1985) estimated a linear and a log linear dynamic import function for each state for the period 1970-1982. Lagged import were included in the model and the short and long-run elasticities were estimated. Metwally (1993), examined the imports pattern in the GCC and found that the reduction in oil revenues of the GCC countries following the fall in oil prices in 1982 has completely disturbed the import-income relationship which was developed during the boom years 1974-81. The marginal propensity to import of most import groups diminished during the period 1982-89. Furthermore, the income elasticity of demand of all imports groups increased during the slump period.

The new advancement in econometric techniques, briefly discussed in Appendix 1, is seen more relevant to estimate the determinants of aggregate imports than the elasticity approach. Abbott and Seddighi (1996) used a multivariate

cointegration analysis to investigate the long-run relationship between imports and other economic variables in the United Kingdom. Their results showed the existence of a unique vector that indicates a long-run relationship. Bahmani-Oskooee (1994) used Engle-Granger method of cointegration between Australia's imports and exports. He found a strong evidence of long-run relationship between the two variables. Bahmani-Oskooee (1995) applied both Engle-Granger method and the Johansen-Juselius cointegrated approach to Iran imports and exports. He found an evidence of cointegration when the nominal (current) values of imports and exports were used and not the real (constant) values. This chapter will use the cointegration approach in determining the effect of the various components of aggregate demand on the imports of members of the GCC

6.3 The Model and the Data

The basic import demand function, has imports as a dependent variable and income and price of imports as an independent variables. However, there are other major factors that may affect a country's demand for imports. Among these factors are the level and the composition of final expenditures, Giovannetti (1989). The composition of final expenditures is a very important factor because the import content of each expenditure component varies. Abbot and Seddighi (1996) indicate that if the components of final demand change then the aggregate marginal propensity to import will change regardless of the changes in the disaggregated marginal propensities.

Components of final expenditures, which affect the demand for imports, include private consumption expenditure, government consumption expenditure,

investment expenditure, and export expenditure. The components of final expenditure in members of the GCC may be relatively more inter-related. The GCC countries import most of their consumer goods as part of the private consumption. Government expenditure involves the importation of both consumption and capital goods for the development of infrastructure. Also, investment expenditure involves the imports of machinery and equipment for the purpose of improving the oil export sector and the development of other sectors. The export sector also relies on imports of capital required for the oil sector.

The model developed and tested in this chapter differs in many ways from that of Abbot and Seddighi (1996). Firstly, the absence of a measure of an accurate domestic price level for imports constrained us from including the relative price index in our model. Secondly, members of the GCC are import-oriented countries and most of the imports do not have domestic substitutes. Thus, because of the infinite supply of imports, import prices can be assumed to be exogenous and should not have an affect on the variation of the demand for imports. Thirdly, the data of the members of GCC do not differentiate between government and private investment. Hence, investment is reported for both sectors combined.

Given the above assumption, the long-run import demand function is specified as follows:

$$Import_t = \beta_0 + \beta_1 Export_t + \beta_2 Invs_t + \beta_3 GovCons_t + \beta_4 PrvCons_t + \varepsilon_t \quad (6.1)$$

Where

$Import_t$ = expenditure on imports at the year t

$Export_t$ = expenditure on exports at the year t

$Invs_t$ = expenditure on investment (gross capital formation) at the year t

$GovCon_t$ = expenditure on government consumption at the year t

$PrvCon_t$ = expenditure on private consumption at the year t

ε_t = Stochastic error term

All variables are in the natural logarithmic form. It is more desirable in econometric models to use constant prices rather than current prices. The main limitation in regard to using constant prices was the lack of appropriate import and export price deflators for each member in the GCC. To overcome this limitation, the import and export price deflators for the GCC members were approximated by using the industrial world import and export price deflators. The logic behind this approximation is that the GCC exports oil mainly to the industrial world, and imports most of its capital and machinery's from the same region. The appropriate price deflator in each member of the GCC deflated the remaining variables. The data used in this chapter are annual data obtained from the International Financial Statistics Yearbook (1998), published by the International Monetary Fund. However, in the case of Kuwait, two years (1990 and 1991) were excluded due to the Iraqi invasion.

The model was tested using three sets of data: (1) Nominal data, i.e. variables measured at current prices. (2) Real series (data), i.e. variables, including exports and imports, measured at constant prices. (3) Real series with both exports and imports deflated by the import price index in order to capture ***real*** gains from

trade, which result from a higher increase in exports prices relative to imports prices. The third type of data yielded the best results, so the results of constant data with adjustment in the terms of trade will be reported for those members of the GCC for which data are available.

6.4 Empirical Results

Economic theory identifies the import demand function as a long-run equilibrium relationship between import and other economic variables. If a long-run relationship exists between imports and the components of final expenditures, the variables included in the model must form a unique cointegrating vector. In essence, testing for cointegration is a test for the existence of equilibrium relationship postulated by economic theory and ultimately the model specification.

The maximum likelihood estimation techniques developed by Johansen (1988) and Johansen and Juselius (1990) was employed as test for cointegration and the existence of a unique cointegrating vector. The Johansen approach is superior to the Engle and Granger approach because of the ability to conduct multivariate testing and the identification of a number of distinct cointegrating vectors. The Microfit 4.0 and Econometric Views (E-views 2.0) econometric packages were used.

6.4.1 Unit Root Test of Stationarity

The first step in implementing the Johansen Maximal Eigen Value approach is to test for the order of integration of each variable included in the model. The Augmented Dickey-Fuller (ADF) equation were estimated as follows:

$$\Delta X_t = \alpha_0 + \beta_0 X_{t-1} + \sum_{t=1}^{n} P_i \Delta X_{t-i} + \delta time + e_t \qquad (6.2)$$

This test (equation 5.2) is the most comprehensive test statistic with the test equation having both a constant term and trend term together with the autoregressive terms. The F-test is calculated for B_0 under the null hypotheses (H_0: $B_0 = \alpha_0 = \delta_0 = 0$). Tables 6.1-6.4 present the ADF test for Kuwait, Oman, Saudi Arabia, and UAE respectively.

Table 6.1: Estimation Results of the Unit Root Tests (The Case of Kuwait)

Variables	ADF test	5% critical value	lag length
Export	-1.706	(-3.602)	3
Δ Export	-4.693	(-3.594)	1
Import	-1.613	(-3.602)	3
Δ Import	-4.302	(-3.594)	1
INVS	-1.670	(-3.602)	3
Δ INVS	-4.041	(-3.587)	0
PCon	-0.822	(-3.602)	3
Δ PCon	-6.567	(-3.587)	0
GCon	-2.835	(-3.602)	3
Δ GCon	-4.893	(-3.594)	1

The null hypothesis is each variable is integrated of order 1 I(1), the 5% critical values are given in parenthesis and derived from E-views econometric package. Δ denotes the first difference of a variable while Δ_2 denotes its second difference.

Table 6.2: Estimation Results of the Unit Root Tests (The Case of Oman)

Variables	ADF test	5% critical value	lag length
Export	-1.497	(-3.602)	3
Δ Export	-3.798	(-3.594)	1
Import	-3.385	(-3.602)	3
Δ Import	-3.796	(-3.594)	1
INVS	-1.669	(-3.602)	3
Δ INVS	-4.541	(-3.594)	1
PCon	-1.099	(-3.602)	3
Δ PCon	-4.731	(-3.594)	1
GCon	-2.885	(-3.602)	3
Δ GCon	-5.038	(-3.594)	1

The null hypothesis is each variable is integrated of order 1 I(1), the 5% critical values are given in parenthesis and derived from E-views econometric package. Δ denotes the first difference of a variable while Δ_2 denotes its second difference.

Table 6.3: Estimation Results of the Unit Root Tests (The Case of Saudi. A.)

Variables	ADF test	5% critical	lag length
Export	-2.051	(-3.602)	3
Δ Export	-4.050	(-3.594)	1
Import	-2.239	(-3.602)	3
Δ Import	-3.619	(-3.594)	1
INVS	-1.889	(-3.602)	3
Δ INVS	-3.613	(-3.594)	1
PCon	-1.991	(-3.602)	3
Δ PCon	-3.830	(-3.594)	1
GCon	-1.569	(-3.602)	3
Δ GCon	-4.018	(-3.594)	1

The null hypothesis is each variable is integrated of order 1 I(1), the 5% critical values are given in parenthesis and derived from E-views econometric package. Δ denotes the first difference of a variable while Δ_2 denotes its second difference.

Table 6.4: Estimation Results of the Unit Root Tests (The Case of UAE.)

Variables	ADF test	5% critical value	lag length
Export	-2.263	(-3.602)	3
Δ Export	-3.988	(-3.594)	1
Import	-1.623	(-3.602)	3
Δ Import	-1.993	(-3.594)	1
Δ_2 Import	-3.857	(-3.602)	1
INVS	-1.115	(-3.645)	3
Δ INVS	-2.529	(-3.633)	0
Δ_2 INVS	-4.4291	(-3.645)	1
PCon	-0.336	(-3.645)	3
Δ Pcon	-4.307	(-3.633)	1
GCon	-1.855	(-3.645)	3
Δ GCon	-3.810	(-3.633)	1

The null hypothesis is each variable is integrated of order 1 I(1), the 5% critical values are given in parenthesis and derived from E-views econometric package. Δ denotes the first difference of a variable while Δ_2 denotes its second difference.

Tables 6.1 to 6.3 show that a number of lagged dependent variables were required to ensure a "white noise" error term. It is clear that the calculated ADF statistic in the case of Kuwait, Oman, and Saudi Arabia is less than its critical value only for the differenced variables. This indicates non-stationarity in all variables at the level and that the variables have achieved stationarity after being differenced once. Thus, the variables are integrated of order one, I(1).

The results in Table 6.4 show that in the case of the UAE some of the variables did not achieve stationarity after the first differencing. Only exports, private consumption, and government consumption are stationary after first

differencing, whereas the variables Import and investment are stationary after second differencing (integrated of second order, I(2)).

To summarize, according to the ADF test results, all the test statistics for the time series variables for each member in the GCC are insignificant at the .05 level. This suggests the existence of unit roots. In the case of Kuwait, Oman, and Saudi Arabia all the variables reached stationarity after first differencing. The fact that the variables are integrated of order one, I(1), will enable us to conduct the cointegration analysis. But in regard to the UAE, some variables reached stationarity after first differencing while the remaining variables after second differencing. Thus, the cointegration analysis will not be practical in this case. Therefor, the following section will present Johansen-Juselius cointegration analysis only for Kuwait, Oman, and Saudi Arabia.

6.4.2 Cointegration Results

Table 6.5 presents the results the Johansen and Juselius maximal eigen-value test for Kuwait, Oman, and Saudi Arabia. The sequential testing procedure at both 5% and 10% significance levels confirm the existence of a unique cointegrating vector. Thus, we can conclude that for the three members of the GCC there is at most one statistically significant vector in relation to the variables identified in the model.

Table 6.5: Johansen Maximum Likelihood Cointegration Test with Unrestricted Intercepts and No Trends in the VAR

Null	Alternative	L-R statistic with one lag	95% Critical Value	90% Critical Value
(Kuwait)				
r = 0	r = 1	36.0408	33.64	31.02
r <= 1	r = 2	20.3597	27.42	24.99
r <=2	r = 3	18.3360	21.88	19.02
(Oman)				
r = 0	r = 1	44.09	33.64	31.02
r <= 1	r = 2	24.77	27.42	24.99
r <=2	r = 3	16.26	21.88	19.02
(Saudi Arabia)				
r = 0	r = 1	42.81	33.64	31.02
r <= 1	r = 2	16.12	27.42	24.99
r <=2	r = 3	9.15	21.88	19.02

The L-R Test statistics are asymptotically χ^2 variates under H_0 hypothesis. The L-R statistic tests that the number of cointegration vectors is at most equal to r. The sequential testing stops when H_0 cannot be rejected.

Table 6.6 presents the unique cointegration vector and the normalized coefficient estimates on aggregate imports.

Table 6.6: Johansen Cointegrating Results for Aggregate Imports Equation.

(Kuwait)

Eigen Vector

log(import)	log(export)	log(GovCon)	log(PrvCon)	log(Invst)
2.4947	-0.7392	-0.5584	0.3619	-1.6793
Normalized Coefficients				
-1.0000	0.2963	0.2238	-0.1450	0.6731

(Oman)

Eigen Vector

log(import)	log(export)	log(GovCon)	log(PrvCon)	log(Invst)
1.0023	-1.5889	-0.0729	0.4518	-0.8625
Normalized Coefficients				
-1.0000	1.5852	0.0727	-0.4507	0.8605

(Saudi Arabia)

Eigen Vector

log(import)	log(export)	log(GovCon)	log(PrvCon)	log(Invst)
0.8156	-0.2734	-0.0413	-0.4458	-0.3734
Normalized Coefficients				
-1.0000	0.335	0.5471	0.4582	0.0491

6.4.3 The GCC Long-Run Equilibrium Relationship

Equation (6.3-5) represents the long-run relationship between variables identified in the aggregate imports model for Kuwait, Oman, and Saudi Arabia respectively:

Import = 0.296 Export + 0.673 Invst + 0.224 GovCon - 0.145 PrvCon (6.3)

Import = 1.585 Export + 0.860 Invst + 0.073 GovCon - 0.451 PrvCon (6.4)

Import = 0.335 Export + 0.049 Invst + 0.547 GovCon - 0.458 PrvCon (6.5)

The Kuwaiti equilibrium relationship (equation 6.3) indicates that Investment is the major determinant of Kuwait aggregate imports in the long-run, while private consumption has the least affect on imports. According the OLS regression, similar results were obtained, all the variables were statistically significant except for private consumption. Kuwait tends to import all kind of goods while exporting only oil. Thus, we don not expect expenditure on private consumption to decrease much with the reduction in oil exports. Therefor, policies directed toward regulating private consumption are not likely to exert any significant impact on the propensity to imports. On the other hand, variation in investment, which consists mainly of imported equipment and machinery, is the major determinant in the variation of the imports level in the long-run. The results also show the significance of the Kuwaiti government consumption over the private consumption expenditure.

The Omani equilibrium relationship (equation 6.4) indicates clearly that total exports is the major determinant of Oman aggregate imports in the long-run, while government consumption has the least affect on imports. Although investment is

also significant in the long-run, total exports appears to dominate the influence of other macro components of final expenditure in the long-run. It should be noted that Oman depends more on non-oil sectors, particularly the agricultural sector, in comparison to the other members. Furthermore, the government expenditure in Oman is not dominant as the Kuwaiti government expenditure, the coefficients of government expenditure for Kuwait and Oman were 0.23 and 0.07 respectively. Therefor, policies directed toward promoting exports and regulating private consumption are more likely to affect the propensity to imports in Oman.

Saudi Arabia equilibrium relationship (equation 6.5) indicates that government consumption is the major determinant of aggregate imports in the long-run, while investment expenditure has the least affect on imports. The results also show that both the export and private consumption have a considerable affect on imports in the long-run. The strong affect of government consumption on imports is an indication of how large and significant is the public sector in Saudi Arabia. The long run equilibrium results suggest that policies directed toward reducing government consumption expenditure and regulating private consumption should have a significant impact on the propensity to imports. The weak impact of investment on imports suggest that government should consider the stepping up of its privatization program in order to promote the role of the private sector.

6.4.4 Linear Restrictions on the Partial Elasticities of Imports

The differences between the partial elasticities of demand to import with respect to export, investment, private, and government expenditure appear to be significant in Kuwait, Oman, and Saudi Arabia. The estimated elasticities average (0.296, 0.673, -0.145, 0.224) for Kuwait; (1.585, 0.86, 0.073, -0.45) for Oman; and (0.335, 0.049, 0.459, 0.547) for Saudi Arabia. Three linear restrictions on the parameters of the cointegrating vector were imposed to test for the differences in those elasticities. The null hypothesis states that long-run coefficients on export, investment, private, and government expenditure are all equal when normalized on aggregate import. Equations (6.6 to 6.8) represent the restricted estimates for Kuwait, Oman, and Saudi Arabia respectively:

$$\text{Import} = 0.2534\ \text{Export} + 0.2534\ \text{Invs} + 0.2534\ \text{GovCon} + 0.2534\ \text{PrvCon}. \quad (6.6)$$

$$\text{Import} = 0.0941\ \text{Export} + 0.0941\ \text{Invs} + 0.0941\ \text{GovCon} + 0.0941\ \text{PrvCon}. \quad (6.7)$$

$$\text{Import} = 0.3548\ \text{Export} + 0.3548\ \text{Invs} + 0.3548\ \text{GovCon} + 0.3548\ \text{PrvCon}. \quad (6.8)$$

The likelihood ratio test statistic of the restricted equation is LR (3) = 21.27, LR (3) = 24.83, LR (3) = 17.11 for Kuwait, Oman, and Saudi Arabia respectively. Thus, the restriction can be rejected at the 5% critical value of (X^2) (3) = 7.81.

6.5 The Short-Run Behavior of Imports and the Error Correction Model

A dynamic error correction model was estimated for the purpose of examining the short-run behavior of Kuwait, Oman, and Saudi Arabia imports. The residuals derived from OLS regression were incorporated into a general error correction model. The short-run dynamic model was estimated using this model:

$$\Delta IMPORT_t = \alpha_o + \sum\alpha_{1i}\,\Delta EXPORT_{t-i} + \sum\alpha_{2i}\,\Delta INVST_{t-i} + \sum\alpha_{3i}\,\Delta GOVCON_{t-i} + \sum\alpha_{4i}\,\Delta PRVCON_{t-i} + \sum\alpha_{5i}\,\Delta IMPORT_{t-i} + \alpha_6\,ECM_{t-1} + \text{error term} \qquad (6.9)$$

6.5.1 The Short-Run Behavior of Kuwait Imports

Equation (6.10) presents the result of the error correction model for Kuwait (t-statistic in parenthesis).

$$\begin{aligned}\Delta Import = {} & 0.021 + 0.172\,\Delta Export + 0.721\,\Delta Invs - 0.047\,\Delta Govcon \\ & (1.861) \qquad (5.607) \qquad (8.993) \qquad (-0.4932) \\ & + 0.301\,\Delta Prvcon - 0.681\,\Delta Import_{t-1} + 0.261\,\Delta Invs_{t-1} + 1.193\,ECM \qquad (6.10) \\ & (4.252) \qquad (-6.747) \qquad (4.358) \qquad (10.815)\end{aligned}$$

$R^2 = 0.9421$ SER= 0.0511 D-W= 1.492 F-statistic = 46.5127

The short-run variation in imports is mainly affected by the variation in most of the macro economic components included in the model. Specifically, changes in exports, investments, and private consumption have the most effect on imports. Expenditure on private consumption although not significant in the long-run is very

significant in the short-run. However, expenditure on investment and the past period level of investment and imports have the most significant affect on the short-run variations in imports. The government consumption expenditure is not significant in the short-run. The relation between government and private consumption in the short and long-run can be analyzed within this context. Government revenues from oil are channeled mainly to the citizens through salaries and various types of subsidies (electricity and health care). Hence, the demand for foreign imports as a component of private consumption is very significant in the short-run. But in the long-run it is the level of government expenditure that has the most affect on the variations of imports. Hence, in the long-run, we expect the demand for imports as part of the private spending not to change regardless of the amount of revenues generated from oil exports, but the opposite applies to government expenditure.

6.5.2 The Short-Run Behavior of Oman Imports

Equation (6.11) presents the result of the error correction model for Oman (t-statistic in parenthesis).

$$\begin{aligned}\Delta Import = {} & 0.0054 + 0.158\ \Delta Export + 0.426\ \Delta Invs + 0.227\ \Delta Govcon \\ & \quad (0.147) \qquad (1.469) \qquad (3.632) \qquad (1.764) \\ & + 0.064\ \Delta Prvcon + 0.101\ \Delta Import_{t-1} + 0.224\ \Delta Govcon_{t-1} + 0.579\ ECM \qquad (6.11) \\ & \quad (0.104) \qquad (1.067) \qquad (2.378) \qquad (3.586)\end{aligned}$$

$R^2 = 0.842$ SER= 0.1221 D-W= 1.569 F-statistic = 14.38

The short-run variation in Oman imports is mainly affected by changes in current period investment and lagged government consumption. Although

government consumption is not significant in the long-run, past period government expenditure does affect demand for imports in the short-run. Investment expenditure affect on the demand for imports is significant in both the short and long-run. These two results suggest that revenues generated from total exports and subsequently channeled into the economy by government expenditure, takes some adjustment period before it affects the demand for imports in the long-run.

6.5.3 The Short-Run Behavior of Saudi Arabia Imports

Equation (6.12) presents the result of the error correction model for Oman (t-statistic in parenthesis).

$$\begin{aligned}\Delta Import = {} & 0.049 + 0.079\ \Delta Export + 0.610\ \Delta Invs - 0.049\ \Delta Govcon \\ & \quad (1.89) \qquad (1.47) \qquad (3.53) \qquad (0.42) \\ & + 0.283\ \Delta Prvcon - 0.239\ \Delta Import_{t-1} + 0.594\ \Delta Invs_{t-1} + 0.712\ ECM \qquad (6.12) \\ & \quad (0.98) \qquad (1.18) \qquad (3.22) \qquad (5.02)\end{aligned}$$

$R^2 = 0.869$ SER= 0.099 D-W= 1.72 F-statistic = 18.09

As can be seen from equation (6.12), the short-run variation in Saudi Arabia imports is mainly affected by changes in current and lagged period investment expenditure. These results suggest that in the short-run, the demand for imports is affected mainly by investment, though in the long-run, the level of government consumption has the most affect on the variation of imports.

The coefficient of the disequilibrium error term exceeds unity in absolute value (ECM=1.19) in the case of Kuwait, and less than unity (ECM=0.58) and (ECM=0.72) in the case of Oman and Saudi Arabia respectively. This coefficient

measures the proportion of any disequilibrium in the previous year that is compensated for in the current period. However, when interpreting the error term in the model it must be born in mind that we are using annual data and not quarterly observations. Hence, the term is likely to be larger and the forecasting is not strictly short term. The error correction model is designed for short-term behavior (monthly or quarterly data).

6.6 Summary and Conclusions

This chapter analyzed the determinants of the aggregate import function of Kuwait, Oman, and Saudi Arabia, using the Johansen multivariate cointegration method. The cointegration analysis was used to examine the long-run relationship between aggregate imports and the main components of final expenditure. The components of final expenditure include export expenditure, government consumption, private consumption, and investment expenditure. The empirical analysis revealed the existence of a unique cointegrated vector for each member. The cointegrated vector confirms the long-run equilibrium between aggregate imports and components of final expenditure.

In the case of Kuwait, the investment expenditure seems to be the most significant determinant of aggregate imports, while private consumption is the least significant. The short-run error correction model indicates that current investment and past period investment and imports are the most significant determinants of imports in the short-run. The empirical results suggest that economic policies directed toward regulating private consumption are not likely to exert any significant impact on the Kuwaiti propensity to imports in the long-run. In contrast, policies that are intended to influence the pattern and type of investment expenditure will be more effective in the long-run. New policies should focus on increasing the absorptive capacity in Kuwait, the production of quality imports substitutes.

Oman cointegrating results indicate that aggregate export expenditure is the most significant determinant of aggregate imports in the long-run, while government consumption is the least significant. The short-run error correction model indicates that current investment and past period government expenditure are the most significant determinants of imports in the short-run. Economic policies directed toward promoting exports and investment, and the regulation of private consumption should affect the propensity to import in the long-run.

Saudi Arabia cointegrating results indicate that government consumption expenditure and private consumption are the most significant determinants of aggregate imports in the long-run, while investment is the least significant. The short-run error correction model indicates that current and past period investment expenditures are the most significant determinants of imports in the short-run. Economic policies directed toward reducing government consumption and regulating private consumption expenditures should affect the propensity to import in the long-run.

The statistical analysis also suggest that there are significant differences between the long-run partial elasticities of imports with respect to the different components of final expenditure in each GCC country considered.

Chapter Seven

Determination of the Resource Balance of the GCC Countries

7.1 Introduction

The oil boom which began following the embargo in late 1973 did not last very long. The year 1982 brought the OPEC to the brink. It has been demonstrated that oil exports of all members of the GCC have declined significantly and continuously since 1983. Saudi oil exports in 1988 were reduced to 18% of their level in 1981, the peak of the boom. The comparable figures for other members were 47%, 50% and 61% in Kuwait, the United Arab Emirates and Oman (a non-OPEC member). The decline in oil exports resulted in substantial decline of imports. However the rates of decline of imports were much less than those of exports (Metwally, 1993). As a consequence the surplus in the trade balance was reduced sharply in each of these economies. Also, as a result of the slump in oil exports, the ratio of imports of goods and services to exports of goods and services rose sharply in each member state. As a consequence, the surplus in the resource balance declined substantially, and even became negative, a phenomenon not known to these economies before 1983 (Metwally and Tamaschke, 1980)..

The aim of this chapter is to examine the impact of the fluctuations in oil prices on the resource balance of the member states of the GCC, and specifically to determine the effect of the interaction between internal and external economic variables on the behavior of the resource balance of these countries. The chapter is divided into four sections. Section two develops and tests a single-equation model to find out the main determinants of the resource balance of the GCC economies. The impact of the interaction between the GCC economies and the rest of the world on the resource balance of the GCC is examined in section three, where a simultaneous-equations model

is developed and tested. Finally section four summarizes the main findings of this study.

7.2 A Single Equation Model of the Resource Balance

The resource balance is defined as exports of goods and non-factor services minus imports of goods and non-factor services. Economic theory suggests that the resource balance varies inversely with GDP. This is based on the assumption that exports are determined by factors outside the domestic economy whereas imports are a function of income level within the domestic economy. It must be realized, however, that in the case of the GCC countries, the total gross domestic product (GDP) is dominated by oil revenue, which is owned by the government and is not automatically available for domestic expenditure. Because of the limited capacity to absorb oil revenues in the GCC economies, an increase in total GDP, basically reflecting increases in oil exports, would automatically add to the overall surplus. Hence, it is possible to get a positive relationship between GDP and the external surplus, contrary to the postulates of economic theory (Metwally, 1987). Since the surplus should be related to a measure of domestic absorption, i.e. a measure of domestic ability to spend on imports, the relevant relationship, in the case of the GCC countries, is that between the resource balance and ***non-oil income*** rather than GDP. And since the export content of the resource balance is a function of external forces (Metwally and Tamaschke, 1994), we may assume that growth in the world economy would have some impact on the performance of the export sector of the GCC countries. Hence, it is reasonable to assume the following functional relationship:

$$(X\text{-}M) = f(Q, W)$$

Where:

(X-M) = Resource balance

Q = Non-oil income

W = Growth of world economy.

The above relationship may be empirically tested using the following single-equation model:

$$(X - M)_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 W_t + u_t$$

Where:

$(X - M)_{it}$ = Resource balance of the ith member in period t
Q_{it} = Non-oil income of the ith member in period t
W_t = Rate of growth of world income in period t

We expect the coefficient α_1 to carry a negative sign and the coefficient α_2 to carry a positive sign. The above model was tested for four GCC member states, namely Kuwait, Oman, Saudi Arabia and the United Arab Emirates for the period 1974-1996. However, in the case of Kuwait, we excluded the two years (1990 and 1991) of the Iraqi aggression. The data were extracted from the IMF International Financial Statistics 1998 Yearbook, the International Bank 1997 World Tables, various issues of GCC Economic Bulletins and the Statistical Abstracts of individual GCC countries. Shazam computer program was used in the estimation (Shazam, 1993). The computer results for the four countries are given in Table 1. These results suggest that:

1. The model is a good fit in all four countries as judged by the values of R^2, adjusted R^2. The two explanatory variables explain approximately 77 percent of the variation in the case of Saudi Arabia; 69 percent in the cases of Kuwait and the

United Arab Emirates and 52 percent in the case of Oman. The values of the DW statistic suggest that there is no serious problem of auto-correlation.

2. The estimated coefficients of all variables carry the correct sign in each case. Also, the values of the "*t*" statistic suggest that all coefficients are statistically significant at, at least, the 5 percent level of significance.

3. The single-equation regression results suggest that there is a significant negative correlation between the resource balance and non-oil income in all GCC countries included in the sample. This suggests that an increase in non-oil income leads to an increase in the level of imports. Given the level of exports, this results in a reduction in the surplus in the resource balance.

4. The regression results of the single-equation model also suggest that world growth exerts a significant positive effect on the resource balance of the GCC through its favorable effect on oil exports of these countries.

5. The resource balance of Oman (a non- OPEC member) is highly elastic with respect to both non-oil income and world growth. The resource balance of both Kuwait and the UAE is highly elastic with respect to non-oil income but inelastic with respect to world growth. The opposite seems to hold true for Saudi Arabia.

Table 7.1: Results of the Single-equation Model

1. KUWAIT

R-SQUARE = 0.6890 R-SQUARE ADJUSTED = 0.6544
VARIANCE OF THE ESTIMATE-SIGMA**2 = 22.135
STANDARD ERROR OF THE ESTIMATE-SIGMA = 4.7048
SUM OF SQUARED ERRORS-SSE= 398.42
MEAN OF DEPENDENT VARIABLE = 4.8370
LOG OF THE LIKELIHOOD FUNCTION = -60.6992

Variable Name	Estimated Coefficient	Standard Error	T-Ratio 18 DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.90046	0.22823	-3.9454	0.0005	-0.6810	-0.57568	-1.7616
WGROWTH	6.6288	2.4288	2.7293	0.9931	0.5410	0.39822	0.64606
CONSTANT	10.233	3.0291	3.3782	0.9983	0.6229	0.00000	2.1155

DURBIN-WATSON = 1.3022 VON NEUMANN RATIO = 1.1574 RHO = 0.23818
RESIDUAL SUM = 0.24647E-13 RESIDUAL VARIANCE = 22.135
SUM OF ABSOLUTE ERRORS= 73.415
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.6890
RUNS TEST: 10 RUNS, 11 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -0.6626
COEFFICIENT OF SKEWNESS = 0.1964 WITH STANDARD DEVIATION OF 0.5012
COEFFICIENT OF EXCESS KURTOSIS = 0.1443 WITH STANDARD DEVIATION OF 0.9719

2. OMAN

R-SQUARE = 0.5176 R-SQUARE ADJUSTED = 0.4693
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.41051
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.64071
SUM OF SQUARED ERRORS-SSE= 8.2103
MEAN OF DEPENDENT VARIABLE = 0.22157
LOG OF THE LIKELIHOOD FUNCTION = -20.7893

Variable Name	Estimated Coefficient	Standard Error	T-Ratio 20 df	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.28813	0.12367	-2.3298	0.0152	-0.4620	-0.38821	-3.3700
WGROWTH	0.92105	0.31897	2.8876	0.9954	0.5424	0.48116	1.9701
CONSTANT	0.53174	0.42251	1.2585	0.8887	0.2709	0.00000	2.3999

DURBIN-WATSON = 1.5568 VON NEUMANN RATIO = 1.6275 RHO = 0.21021
RESIDUAL SUM = 0.53291E-14 RESIDUAL VARIANCE = 0.41051
SUM OF ABSOLUTE ERRORS= 9.8995
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.5176
RUNS TEST: 8 RUNS, 11 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -1.9153
COEFFICIENT OF SKEWNESS = 0.2893 WITH STANDARD DEVIATION OF 0.4813
COEFFICIENT OF EXCESS KURTOSIS = 2.7593 WITH STANDARD DEVIATION OF 0.9348

Table 1 (continued)
3. Saudi Arabia

R-SQUARE = 0.7671 R-SQUARE ADJUSTED = 0.7438
VARIANCE OF THE ESTIMATE-SIGMA**2 = 234.81
STANDARD ERROR OF THE ESTIMATE-SIGMA = 15.324
SUM OF SQUARED ERRORS-SSE= 4696.2
MEAN OF DEPENDENT VARIABLE = 20.787
LOG OF THE LIKELIHOOD FUNCTION = -93.8043

Variable Name	Estimated Coefficient	Standard Error	T-Ratio 20 DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.81402	0.20450	-3.9805	0.0004	-0.6649	-0.43863	-0.87416
WGROWTH	44.443	7.2604	6.1213	1.0000	0.8075	0.67454	1.0132
CONSTANT	17.896	7.0172	2.5504	0.9905	0.4954	0.00000	0.86093

DURBIN-WATSON = 1.3351 VON NEUMANN RATIO = 1.1866 RHO = 0.22936
RESIDUAL SUM = 0.12879E-12 RESIDUAL VARIANCE = 234.81
SUM OF ABSOLUTE ERRORS= 259.22
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7671
RUNS TEST: 8 RUNS, 13 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -1.8706
COEFFICIENT OF SKEWNESS = -0.0005 WITH STANDARD DEVIATION OF 0.4813
COEFFICIENT OF EXCESS KURTOSIS = 0.2480 WITH STANDARD DEVIATION OF 0.9348

4. United Arab Emirates

R-SQUARE = 0.6878 R-SQUARE ADJUSTED = 0.6566
VARIANCE OF THE ESTIMATE-SIGMA**2 = 36.827
STANDARD ERROR OF THE ESTIMATE-SIGMA = 6.0685
SUM OF SQUARED ERRORS-SSE= 736.54
MEAN OF DEPENDENT VARIABLE = 6.6268
LOG OF THE LIKELIHOOD FUNCTION = -72.5001

Variable Name	Estimated Coefficient	Standard Error	T-Ratio 20 DF	P-value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.78993	0.17003	-4.6457	0.0001	-0.7204	-0.60406	-1.2928
WGROWTH	9.5797	2.9307	3.2687	0.9981	0.5901	0.42502	0.68509
CONSTANT	10.654	2.8897	3.6868	0.9993	0.6361	0.00000	1.6077

DURBIN-WATSON = 1.7005 VON NEUMANN RATIO = 1.7778 RHO = 0.09709
RESIDUAL SUM = -0.87930E-13 RESIDUAL VARIANCE = 36.827
SUM OF ABSOLUTE ERRORS= 106.51
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.6878
RUNS TEST: 12 RUNS, 13 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -0.1323
COEFFICIENT OF SKEWNESS = -0.0043 WITH STANDARD DEVIATION OF 0.4813
COEFFICIENT OF EXCESS KURTOSIS = -0.2732 WITH STANDARD DEVIATION OF 0.9348

7.3 A Simultaneous Equation Model

Because of their high degree of openness, the GCC economies interact strongly with the rest of the world. The growth in the world economy results in an increase in the demand for oil. This results in an increase in the incomes of the GCC countries, which in turn stimulate their demand for imports. This promotes world growth. However, sudden and sharp rises in oil prices, as happened in the mid seventies, increase costs of production of the oil importers which may slow their rates of growth and hence their demand for oil.

It follows from the above that the determination of the behavior of the resource balance of the GCC countries should be examined by a simultaneous-equations model to take an explicit account of the mentioned process of interaction and capture any possible feedback effects (Metwally and Tamaschke, 1994a).

The following simultaneous relationship, known as structural equations, have been developed :

Structural equations:

$$(X - M)_{it} = a_o + a_1 Q_{it} + a_2 W_t + u_1$$

$$Q_{it} = b_0 + b_1 G_{it} + b_2 X_{it} + b_3 Q_{i\,t-1} + u_2$$

$$X_{it} = c_0 + c_1 P_t + c_2 C_t + c_3 M_{it} + u_3$$

$$M_{it} = d_0 + d_1 Q_{it} + d_2 M_{it-1} + u_4$$

Endogenous Variables:

$(X - M)_{it}$ = Resource balance of the ith member in period t

Q_{it} = Non-oil income of the ith member in period t

X_{it} = Exports of goods and services of the ith member in period t

M_{it} = Imports of goods and services of the ith member in period t

Predetermined Variables:

G_{it} = Government expenditure of the ith member in period t

P_t = Oil prices in period t

W_t = Rate of growth of world income in period t

C_t = Growth in oil consumption of major trading partners in period t

M_{it-1} = Imports of the ith member in period t-1

Q_{it-1} = Non-oil income of the ith member in period t-1

The first equation is the same as the single-equation model discussed above. It examines the relationship between the resource balance of each GCC country, the non-oil income of that country, and the growth in the world economy. We expect the coefficient a_1 to carry a negative sign and the coefficient a_2 to carry a positive sign.

The second equation in the system investigates the relationship between non-oil income, exports and government expenditure (on consumption and investment). The last variable is important, since it is considered the most vital, if not the sole, control variable available to the government of a member state to regulate economic activity. Actually, changes in government spending are the vehicles through which oil revenues are translated into domestic income in the GCC countries (Metwally and Perara, 1995). Even during the years of recession, the government of most member states maintained a

high level of spending to boost the internal economy. This was financed, mainly, by drawing on accumulated reserves. A process of partial adjustment is tested by introducing the lagged variable $Q_{i\ t-1}$. We expect the coefficients b_1 and b_2 to be positive and the coefficient b_3 to lie between zero and one.

The third equation tests the hypothesis that oil exports are determined by the forces of demand for and supply of oil. Oil prices and growth in oil consumption of major trading partners are assumed to be the main predictors (Metwally and Tamaschke, 1995). It is expected that an increase in oil prices leads to an increase in export proceeds of the GCC, given the quantities exported. It is also expected that a rise in the rate of growth of oil consumption leads to an increase in its demand for oil, given the price of oil. Thus the two coefficients, c_1 and c_2, are expected to carry a positive sign. To test if there is any feedback effect, the GCC members' imports of goods and services were introduced as explanatory variables in the export equation. If there is a significant feedback effect, the coefficient c_3 would be statistically significant.

The fourth equation shows that the demand for imports is a function of non-oil income which is an appropriate measure of domestic ability to spend on imports. However, there is some degree of rigidity in imports adjustment to variations in oil income. It is reasonable to assume that there is a partial adjustment mechanism in the response of the demand for imports to changes in oil exports.

In order to understand this process of adjustment, suppose M^*_t is the desired level of spending on imports, M_t is the actual level, and Q_t is non-oil income . Assume that the desired level of spending depends on income as:

$$M^*_t = \alpha + \beta Q_t$$

Because of "frictions" in the market, the gap between the actual and desired levels cannot be closed simultaneously but only with some lag and random shocks (Greene, 1993). Suppose only a fraction of the gap is closed each period. In this case, spending on imports in time t would equal that at time t-1, plus an adjustment factor, plus a random error term. More formally,

$$M_t = M_{t-1} + \lambda (M^*_t - M_{t-1}) + u_t \qquad 0 < \lambda < 1$$

The parameter λ is called the adjustment coefficient and $1/\lambda$ is called the speed of adjustment.

The adjustment coefficient approximates the fraction of the gap closed in one period. The speed of adjustment approximates the number of periods it takes for most of the adjustment to take place (Gujarati, 1995). Thus, if $\lambda = 0.25$, approximately 25 per cent of the gap will be closed in one period, and the number of periods of adjustment is 4. If the desired level of spending on imports M^* exceeds the actual spending level at the end of the time period t-1, we would expect part of that gap to close in period t, and hence Y_t will go up by $\lambda (Y^*_t - Y_{t-1})$ plus an unpredictable random shock (Davidson and Mackinnon, 1993). Combining the above two equations we get the model:

$$M_t = \alpha \lambda + (1 - \lambda) M_{t-1} + \beta \lambda Q_t + u_t$$

$$= \beta_0 + \beta_1 M_{t-1} + \beta_2 Q_t + u_t$$

The above equation is the same as equation 4:

$$M_{it} = d_0 + d_1 Q_{it} + d_2 M_{it-1} + u_4$$

The coefficient d_1 represents the short-run marginal propensity to import, and its long-run counterpart is given by (d_1 / 1 - d_2). With this equation, the logical sequence of the feedback effect is complete.

The above system is mathematically complete in the sense that it contains as many equations as it contains endogenous variables. In order to select an appropriate method of estimation, we need to examine the identifiability of the structural equations

7.3.1 The Rank and Order Conditions of Identifiability

There are two conditions for identification: an order condition and a rank condition. The order condition may be stated as follows: for an equation to be identified, the total number of variables (endogenous and exogenous) excluded from it must be equal to or greater than the number of endogenous variables in the model less one (Ramanathan, 1992). This condition may be symbolically expressed as:

$$(K - M) >= (G - 1)$$

where:

G = total number of equations (= total number of endogenous variables)

K = number of total variables in the model (endogenous and predetermined)

M = number of variables, endogenous and exogenous, included in a particular equation.

If the equality sign is satisfied, that is (K - M) = (G - 1), the equation is exactly identified. If the inequality sign holds, that is if (K - M) > (G - 1), the equation is over-identified (Maddala, 1992).

The order condition of identification is only a necessary condition. A sufficient condition for identification of a relationship is that the rank of the matrix of parameters of all the excluded variables (endogenous and predetermined) from that equation be equal to (G - 1). This is called the rank condition of identification. In other words the rank condition states that in a system of G equations, any particular equation is identified if, and only if, it is possible to construct at least one non-zero determinant of order (G - 1) from the coefficients of the variables excluded from that particular equation but contained in the other equations of the model (Griffiths et al, 1993).

Applying the order condition of identification to our simultaneous equations model, we notice that for each equation:

$$(K - M) >= (G - 1)$$

where:

G = total number of equations (= total number of endogenous variables)

K = number of total variables in the model (endogenous and predetermined)

M = number of variables, endogenous and exogenous, included in a particular equation.

Hence, each equation is over-identified (Maddala, 1992). We also verify that it is possible to construct at least one non-zero determinant of order (G - 1) from the coefficients of the variables excluded from that particular equation but contained in the other equations of the model (Griffiths et al, 1993). Hence, the rank condition of identification also holds. Given that each equation is over-identified, the method of two-stage least squares is appropriate to estimate the equations of the model (Charemza and Deadman, 1992).

7.3.2 The Simultaneous Equation Model Results

The data were extracted from the same sources mentioned above and the model was estimated for the same four GCC countries during the same period as with the single-equation model. Shazam computer program was used in the estimation (Shazam, 1993). The computer results for the three equations for the three major trading partners are given in Tables 2, 3, 4 and 5.

The regression results, in all cases, suggest that the model is a good fit as indicated by the values of (adjusted) R^2 and F statistics. Also, the estimated D-W statistic suggests that there is no serious problem of serial correlation (Kennedy, 1993). It should be noted that the relevant test statistic for serial correlation, in models where the lagged dependent variable is used as an explanatory variable, is Durbin's h and not Durbin –Watson statistic. However, the various test statistics are given for what they are worth since their precise meaning in small sample simultaneous models is arguable (Griffiths et al, 1993).

The simultaneous-equations model results suggest that:

1. The simultaneous -equations model results support the single-equation model result that there is a significant negative correlation between the resource balance and non-oil income in all GCC countries studied. Also, world growth exerts a significant positive effect on the resource balance of these countries. However, the simultaneous model seems to give better statistical results (judged by the "t" values) than the single-equation model.
2. Equation 2 results suggest that non-oil income, in all GCC countries included in the sample, is positively correlated with government expenditure, exports and lagged values. However, a close examination of the "t" values of the coefficients of the explanatory variables in this equation suggests that:

- Government expenditure exerts a much stronger influence on the performance of the non-oil sector than oil exports. This implies that the downturn in oil prices has weakened the relationship between the oil sector and the non-oil sector in the GCC countries. Thus at the times when the oil sector was shrinking, the non-oil sector was expanding as a result of injection of government expenditure which was financed by the running down of reserves and the accumulation of deficit and internal debt.

- The elasticity of non-oil income with respect to government expenditure is much greater than with respect to exports. This seems to hold for all GCC countries covered by this study.

- The response of the non-oil sector to changes in exports and government expenditure is subject to a partial adjustment mechanism. The speed of adjustment is greater in the case of Kuwait (approximately 1.38 years) than in other GCC states (2.07, 2.98 and 2.23 in the cases of Oman, Saudi Arabia, and the UAE respectively).

- The long-term elasticity of non-oil income with respect to both exports and government expenditure is greater than its short-term counterpart.

- The response of the non-oil income to exports is strongest in the case of the United Arab Emirates and weakest in the case of Saudi Arabia. Furthermore, the

response of the non-oil sector to changes in government expenditure is strongest in the case of Kuwait and weakest in the case of Saudi Arabia.

3. The regression results of equation three of the simultaneous-equations model suggest that, in all sample countries, there is a significant positive relationship between exports and each of oil prices and the rate of growth of oil consumption of the major trading partners. The "t" values of the estimated coefficients of the two variables are significant beyond the 5 per cent level of significance.

4. The regression results of the third equation suggest that there is no significant feedback effect in the relationship between exports of the GCC countries and their demand for imports. The "t" values of the coefficient of the variable "imports" are below the critical values at the 5 % level of significance in all cases. These results are not surprising given the fact that each member's imports amount to a very small fraction of total world exports.

5. The regression results of the fourth equation suggest that non-oil income is a major determinant of spending on imports in each GCC country covered by the study. The "t" value of the coefficient of the variable "Nonoil" which represents non-oil income is significant beyond the 5 per cent level of significance in each case.

6. The short-run marginal propensity to import with respect to non-oil income is much lower in Oman (.393) than in the other three states (0.480, 0.556 and 0.645 for Kuwait, Saudi Arabia and the UAE respectively). The same is also true with respect

to the short-term elasticity of imports with respect to non-oil income (valued at the means). This elasticity is valued at 0.486, 0.535, 0.273 and 0.583 for Kuwait, Saudi Arabia, Oman, and the UAE respectively.

7. The coefficient of the lagged imports variable is statistically significant in all cases which suggests that changes in imports resulting from changes in non-oil income is subject to a partial adjustment mechanism. The speed of adjustment is similar in the cases of Kuwait and the UAE (1.5 and 1.57 periods respectively). The speed is slower in the case of Saudi Arabia (1.85 periods) and much slower in the case of Oman (2.25).

8. The long-term marginal propensity to import with respect to non-oil income is greater than its short-term counterpart in all cases. This coefficient is greater than one in both Saudi Arabia and the UAE (1.03 and 1.016 respectively) but much smaller in the cases of Kuwait and Oman (0.720 and 0.885 respectively). The long-run elasticity of imports with respect to non-oil income (valued at the means) is smaller in the case of Oman (0.564) than in other cases (0.708, 0.944 and 0.873 for Kuwait, Saudi Arabia and the UAE respectively).

7.4 Conclusions

The main findings of this chapter may be summarized in the following:

1. Non-oil income and growth in world economy are major determinants of the resource balances of the member states of the Gulf Cooperation Council. However, the relationship between the resource balance and non-oil income is better studied by a simultaneous-equations model which takes into account the interaction between the economies of the GCC and the rest of the world.

2. The simultaneous-equations model results suggest that the resource balance of each GCC member covered by the study is negatively correlated with non-oil income and positively correlated with growth in the world economy.

3. The econometric analysis revealed that non-oil income in all GCC countries was more affected by changes in government expenditure than by changes in export revenues during the period of the study. Also, the elasticity of non-oil income with respect to government expenditure is much greater than with respect to exports. Moreover, the response of the non-oil sector to changes in exports and government expenditure is subject to a partial adjustment mechanism.

4. The regression results suggest that GCC exports are strongly influenced by oil prices and growth in oil consumption of major trading partner.

5. There do not seem to be any significant feedback effects in the case of GCC members, taken individually, owing mainly to the small contribution of each member's imports to the world economy.

6. The simultaneous-equations model results indicate that non-oil income is a major determinant of spending on imports in each GCC country. The results also indicate that changes in imports resulting from changes in non-oil income is subject to a partial adjustment mechanism. The speed of adjustment is similar in the cases of Kuwait and the UAE, slower in the case of Saudi Arabia and much slower in the case of Oman.

7. The regression results suggest that the elasticity of GCC imports from its major trading partners with respect to the GCC exports to these partners is not uniform.

8. The simultaneous-equations model results suggest that the behavior of the Omani economy, a non-OPEC member, differs to a significant extent, from that of other GCC (OPEC) Members. This difference is reflected in the magnitudes of the marginal propensity to import, elasticity of imports and speed of adjustment of non-oil revenue to government expenditure and exports and of imports to non-oil income.

Table 7.2
Regression Results of the Simultaneous Equations Model
KUWAIT: Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = RBALANCE
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
21 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.6870 R-SQUARE ADJUSTED = 0.6523
VARIANCE OF THE ESTIMATE-SIGMA**2 = 19.089
STANDARD ERROR OF THE ESTIMATE-SIGMA = 4.3691
SUM OF SQUARED ERRORS-SSE= 400.87
MEAN OF DEPENDENT VARIABLE = 4.8370

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.97637	0.2180	-4.479	0.000	-0.726	-0.6242	-1.9101
WGROWTH	6.2782	2.268	2.768	0.997	0.546	0.3772	0.6119
CONSTANT	11.116	2.875	3.867	1.000	0.674	0.0000	2.2982

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	0.47526E-01		
WGROWTH	0.21948	5.1429	
CONSTANT	-0.55319	-4.5013	8.2656
	NONOIL	WGROWTH	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
WGROWTH	0.44394	1.0000	
CONSTANT	-0.88261	-0.69040	1.0000
	NONOIL	WGROWTH	CONSTANT

DURBIN-WATSON = 1.4700 VON NEUMANN RATIO = 1.1235 RHO = 0.34243
RESIDUAL SUM = -0.13767E-13 RESIDUAL VARIANCE = 19.089
SUM OF ABSOLUTE ERRORS= 74.101
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.6879
RUNS TEST: 10 RUNS, 11 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -0.6626

Table 7.2 (cont)
Regression Results of the Simultaneous Equations Model
KUWAIT: Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = NONOIL
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
21 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.9456 R-SQUARE ADJUSTED = 0.9360
VARIANCE OF THE ESTIMATE-SIGMA**2 = 1.3565
STANDARD ERROR OF THE ESTIMATE-SIGMA = 1.1647
SUM OF SQUARED ERRORS-SSE= 28.487
MEAN OF DEPENDENT VARIABLE = 9.4626

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
			ASYMPTOTIC				
GEXPEND	0.87332	0.1288	6.781	1.000	0.854	0.7898	0.8325
EXPORTS	0.11401	0.5618E-01	2.030	0.979	0.442	0.1449	0.1710
NONOILL	0.27645	0.1084	2.549	0.995	0.526	0.2720	0.2587
CONSTANT	-2.4811	1.288	-1.926	0.027	-0.423	0.0000	-0.2622

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GEXPEND	0.16589E-01			
EXPORTS	0.30325E-02	0.31557E-02		
NONOILL	-0.11797E-01	-0.81195E-03	0.11761E-01	
CONSTANT	-0.88214E-01	-0.64950E-01	0.13801E-01	1.6599
	GEXPEND	EXPORTS	NONOILL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GEXPEND	1.0000			
EXPORTS	0.41914	1.0000		
NONOILL	-0.84461	-0.13328	1.0000	
CONSTANT	-0.53161	-0.89742	0.98776E-01	1.0000
	GEXPEND	EXPORTS	NONOILL	CONSTANT

DURBIN-WATSON = 1.2983 VON NEUMANN RATIO = 1.2582 RHO = 0.39927
RESIDUAL SUM = 0.14211E-13 RESIDUAL VARIANCE = 1.3565
SUM OF ABSOLUTE ERRORS= 19.461
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.9456
RUNS TEST: 9 RUNS, 7 POSITIVE, 14 NEGATIVE, NORMAL STATISTIC = -0.6761

Table 7.2 (cont)
Regression Results of the Simultaneous Equations Model
KUWAIT: Equation 3

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = EXPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
21 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7403 R-SQUARE ADJUSTED = 0.6945
VARIANCE OF THE ESTIMATE-SIGMA**2 = 10.463
STANDARD ERROR OF THE ESTIMATE-SIGMA = 3.2347
SUM OF SQUARED ERRORS-SSE= 219.73
MEAN OF DEPENDENT VARIABLE = 14.192

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
OILPRICE	0.58642	0.1075	5.453	1.000	0.798	0.6747	0.8221
CONSGROW	1.4076	0.5840	2.410	0.992	0.505	0.3012	0.2857
IMPORTS	-0.34544	0.1979	-1.746	0.040	-0.390	-0.2002	-0.2277
CONSTANT	1.7015	2.824	0.6025	0.727	0.145	0.0000	0.1199

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

OILPRICE	0.11564E-01			
CONSGROW	-0.27423E-01	0.34107		
IMPORTS	0.24850E-02	-0.21154E-01	0.39153E-01	
CONSTANT	-0.17431	-0.23913	-0.35477	7.9740
	OILPRICE	CONSGROW	IMPORTS	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

OILPRICE	1.0000			
CONSGROW	-0.43666	1.0000		
IMPORTS	0.11679	-0.18306	1.0000	
CONSTANT	-0.57402	-0.14500	-0.63494	1.0000
	OILPRICE	CONSGROW	IMPORTS	CONSTANT

DURBIN-WATSON = 1.6819 VON NEUMANN RATIO = 1.7660 RHO = 0.12774
RESIDUAL SUM = -0.26645E-13 RESIDUAL VARIANCE = 10.463
SUM OF ABSOLUTE ERRORS= 49.746
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7403
RUNS TEST: 8 RUNS, 11 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -1.5603

Table 7.2 (cont)
Regression Results of the Simultaneous Equations Model
KUWAIT: Equation 4

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = IMPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
21 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.9299 R-SQUARE ADJUSTED = 0.9221
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.94799
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.97365
SUM OF SQUARED ERRORS-SSE= 19.908
MEAN OF DEPENDENT VARIABLE = 9.3550

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	0.48006	0.9719E-01	4.939	1.000	0.759	0.6517	0.4856
IMPORTL	0.33392	0.1239	2.695	0.996	0.536	0.3475	0.3138
CONSTANT	1.8770	0.5349	3.509	1.000	0.637	0.0000	0.2006

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	0.94464E-02		
IMPORTL	-0.10768E-01	0.15356E-01	
CONSTANT	0.52718E-02	-0.33089E-01	0.28612
	NONOIL	IMPORTL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
IMPORTL	-0.89409	1.0000	
CONSTANT	0.10140	-0.49919	1.0000
	NONOIL	IMPORTL	CONSTANT

DURBIN-WATSON = 1.7351 VON NEUMANN RATIO = 1.8219 RHO = 0.12303
RESIDUAL SUM = -0.88818E-14 RESIDUAL VARIANCE = 0.94799
SUM OF ABSOLUTE ERRORS= 18.223
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.9300
RUNS TEST: 10 RUNS, 9 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -0.5883

Table 7.3
Regression Results of the Simultaneous Equations Model
OMAN: Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = RBALANCE
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES 23 OBSERVATIONS
R-SQUARE = 0.6175 R-SQUARE ADJUSTED = 0.5459
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.35698
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.59748
SUM OF SQUARED ERRORS-SSE= 8.2105
MEAN OF DEPENDENT VARIABLE = 0.22157

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	Partial P-Value	Standardized Corr. Coefficient		Elasticity At Means
NONOIL	-0.28496	0.1181	-2.413	0.008	-0.475	-0.3839	-3.3329
WGROWTH	0.92401	0.2984	3.097	0.999	0.569	0.4827	1.9764
CONSTANT	0.52212	0.4015	1.300	0.903	0.279	0.0000	2.3565

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	.13951E-01		
WGROWTH	0.13034E-01	0.89040E-01	
CONSTANT	-0.42330E-01	-0.75973E-01	0.16122
	NONOIL	WGROWTH	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
WGROWTH	0.36980	1.0000	
CONSTANT	-0.89255	-0.63410	1.0000
	NONOIL	WGROWTH	CONSTANT

DURBIN-WATSON = 1.5589 VON NEUMANN RATIO = 1.6297 RHO = 0.20938
RESIDUAL SUM = 0.33307E-15 RESIDUAL VARIANCE = 0.35698
SUM OF ABSOLUTE ERRORS= 9.8830
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.5175
RUNS TEST: 8 RUNS, 11 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -1.9153

Table 7.3 (cont)
Regression Results of the Simultaneous Equations Model
OMAN: Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = NONOIL
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.9432 R-SQUARE ADJUSTED = 0.9342
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.76358E-01
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.27633
SUM OF SQUARED ERRORS-SSE= 1.7562
MEAN OF DEPENDENT VARIABLE = 2.5914

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	Partial P-Value	Standardized Corr. Coefficient	Elasticity At Means
GEXPEND	0.48668	0.5959E-01	8.167	1.000	0.882	0.5622	0.4705
EXPORTS	0.10249	0.5014E-01	2.044	0.980	0.425	0.1101	0.1132
NONOILL	0.51856	0.7112E-01	7.292	1.000	0.858	0.5083	0.5097
CONSTANT	-0.24227	0.2239	-1.082	0.140	-0.241	0.0000	-0.0935

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GEXPEND	0.35512E-02			
EXPORTS	-0.98826E-05	0.25143E-02		
NONOILL	-0.28967E-02	0.56239E-03	0.50576E-02	
CONSTANT	-0.14902E-02	-0.86063E-02	-0.72356E-02	0.50125E-01
	GEXPEND	EXPORTS	NONOILL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GEXPEND	1.0000			
EXPORTS	-0.33073E-02	1.0000		
NONOILL	-0.68352	0.15771	1.0000	
CONSTANT	-0.11170	-0.76662	-0.45444	1.0000
	GEXPEND	EXPORTS	NONOILL	CONSTANT

DURBIN-WATSON = 2.1041 VON NEUMANN RATIO = 2.1997 RHO = -0.10724
RESIDUAL SUM = -0.28866E-14 RESIDUAL VARIANCE = 0.76358E-01
SUM OF ABSOLUTE ERRORS= 5.1630
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.9432
RUNS TEST: 13 RUNS, 13 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = 0.3023

Table 7.3 (cont)
Regression Results of the Simultaneous Equations Model
OMAN: Equation 3

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = EXPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8821 R-SQUARE ADJUSTED = 0.8634
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.18270
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.42744
SUM OF SQUARED ERRORS-SSE= 4.2022
MEAN OF DEPENDENT VARIABLE = 2.8630

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	Partial P-Value	Standardized Corr. Coefficient		Elasticity At Means
OILPRICE	0.12616	0.1881E-01	6.708	1.000	0.838	0.7078	0.8752
CONSGROW	0.39149	0.1201	3.261	0.999	0.599	0.3337	0.3918
IMPORTS	0.11225	0.8505E-01	1.320	0.907	0.290	0.1215	0.1055
CONSTANT	-1.0664	0.3901	-2.734	0.003	-0.531	0.0000	-0.3725

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

	OILPRICE	CONSGROW	IMPORTS	CONSTANT
OILPRICE	0.35379E-03			
CONSGROW	-0.15834E-02	0.14416E-01		
IMPORTS	0.85645E-03	-0.50199E-02	0.72342E-02	
CONSTANT	-0.47942E-02	0.36503E-02	-0.22092E-01	0.15215

CORRELATION MATRIX OF COEFFICIENTS

	OILPRICE	CONSGROW	IMPORTS	CONSTANT
OILPRICE	1.0000			
CONSGROW	-0.70113	1.0000		
IMPORTS	0.53535	-0.49156	1.0000	
CONSTANT	-0.65346	0.77943E-01	-0.66590	1.0000

DURBIN-WATSON = 1.8286 VON NEUMANN RATIO = 0.8662 RHO = 0.55214
RESIDUAL SUM = -0.29532E-13 RESIDUAL VARIANCE = 0.18270
SUM OF ABSOLUTE ERRORS= 8.3664
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8821
RUNS TEST: 9 RUNS, 13 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -1.4360

Table 7.3 (cont)
Regression Results of the Simultaneous Equations Model
OMAN: Equation 4

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = IMPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8951 R-SQUARE ADJUSTED = 0.8846
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.19049
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.43645
SUM OF SQUARED ERRORS-SSE= 4.3813
MEAN OF DEPENDENT VARIABLE = 2.6907

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	Partial P-Value	Standardizes Corr. Coefficient		Elasticity At Means
NONOIL	0.55588	0.2226	2.497	0.994 0	.488	0.4780	0.5354
IMPORTL	0.46032	0.1811	2.542	0.994 0	.494	0.4766	0.4328
CONSTANT	0.85659E-01	0.2405	0.3562	0.639	0.079	0.0000	0.0318

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	0.49543E-01		
IMPORTL	-0.37606E-01	0.32799E-01	
CONSTANT	-0.33250E-01	0.14475E-01	0.57828E-01
	NONOIL	IMPORTL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
IMPORTL	-0.93289	1.0000	
CONSTANT	-0.62120	0.33237	1.0000
	NONOIL	IMPORTL	CONSTANT

DURBIN-WATSON = 1.6549 VON NEUMANN RATIO = 1.7301 RHO = 0.15873
RESIDUAL SUM = -0.39968E-14 RESIDUAL VARIANCE = 0.19049
SUM OF ABSOLUTE ERRORS= 7.0065
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8953
RUNS TEST: 11 RUNS, 9 POSITIVE, 14 NEGATIVE, NORMAL STATISTIC = -0.4296

Table 7.4
Regression Results of the Simultaneous Equations Model
Saudi Arabia: Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = RBALANCE
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7671 R-SQUARE ADJUSTED = 0.7438
VARIANCE OF THE ESTIMATE-SIGMA**2 = 204.19
STANDARD ERROR OF THE ESTIMATE-SIGMA = 14.290
SUM OF SQUARED ERRORS-SSE= 4696.4
MEAN OF DEPENDENT VARIABLE = 20.787

Variable Name	Estimated Coefficient	Standard Error	ASYMPTOTIC T-Ratio ***** DF	P-VALUE	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.82046	0.2028	-4.045	0.000	-0.671	-0.4421	-0.8811
WGROWTH	44.397	6.789	6.540	1.000	0.825	0.6738	1.0122
CONSTANT	18.062	6.780	2.664	0.996	0.512	0.0000	0.8689

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

	NONOIL	WGROWTH	CONSTANT
NONOIL	0.41132E-01		
WGROWTH	`0.29530	46.086	
CONSTANT	-.0581	-28.433	45.974

CORRELATION MATRIX OF COEFFICIENTS

	NONOIL	WGROWTH	CONSTANT
NONOIL	1.0000		
WGROWTH	0.21448	1.0000	
CONSTANT	-0.76948	-0.61770	1.0000

DURBIN-WATSON = 1.3136 VON NEUMANN RATIO = 1.1851 RHO = 0.42991
RESIDUAL SUM = 0.13589E-12 RESIDUAL VARIANCE = 204.19
SUM OF ABSOLUTE ERRORS= 259.43
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7671
RUNS TEST: 8 RUNS, 13 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -1.8706

Table 7.4 (cont)
Regression Results of the Simultaneous Equations Model
Saudi Arabia: Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = NONOIL
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8798 R-SQUARE ADJUSTED = 0.8608
VARIANCE OF THE ESTIMATE-SIGMA**2 = 30.603
STANDARD ERROR OF THE ESTIMATE-SIGMA = 5.5320
SUM OF SQUARED ERRORS-SSE= 703.86
MEAN OF DEPENDENT VARIABLE = 22.323

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
GEXPEND	0.38219	0.1368	2.794	0.997	0.540	0.3507	0.3985
EXPORTS	0.12637E-01	0.4424E-01	0.2856	0.612	0.065	0.0221	0.0300
NONOILL	0.66418	0.1314	5.056	1.000	0.757	0.6331	0.6133
CONSTANT	-0.93217	3.425	-0.2721	0.393	-0.062	0.0000	-0.0418

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GEXPEND	0.18710E-01			
EXPORTS	0.44234E-03	0.19574E-02		
NONOILL	-0.14587E-01	0.15769E-03	0.17255E-01	
CONSTANT	-0.15823	-0.11726	-0.24533E-01	11.732
	GEXPEND	EXPORTS	NONOILL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GEXPEND	1.0000			
EXPORTS	0.73093E-01	1.0000		
NONOILL	-0.81183	0.27133E-01	1.0000	
CONSTANT	-0.33771	-0.77380	-0.54527E-01	1.0000
	GEXPEND	EXPORTS	NONOILL	CONSTANT

DURBIN-WATSON = 1.5913 VON NEUMANN RATIO = 1.6637 RHO = 0.09146
RESIDUAL SUM = -0.85265E-13 RESIDUAL VARIANCE = 30.603
SUM OF ABSOLUTE ERRORS= 91.716
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8798
RUNS TEST: 10 RUNS, 9 POSITIVE, 14 NEGATIVE, NORMAL STATISTIC = -0.8786

Table 7.4 (cont)
Regression Results of the Simultaneous Equations Model
Saudi Arabia: Equation 3

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = EXPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7249 R-SQUARE ADJUSTED = 0.6814
VARIANCE OF THE ESTIMATE-SIGMA**2 = 213.87
STANDARD ERROR OF THE ESTIMATE-SIGMA = 14.624
SUM OF SQUARED ERRORS-SSE= 4919.0
MEAN OF DEPENDENT VARIABLE = 52.988

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
OILPRICE	2.7211	0.5480	4.965	1.000	0.752	0.6815	1.0199
CONSGROW	8.0472	3.999	2.012	0.978	0.419	0.3062	0.4351
IMPORTS	-0.28579	0.2351	-1.215	0.112	-0.269	-0.1622	-0.1737
CONSTANT	-14.911	10.67	-1.398	0.081	-0.305	0.0000	-0.2814

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

OILPRICE	0.30032			
CONSGROW	-1.2827	15.994		
IMPORTS	0.16418E-01	-0.42040	0.55288E-01	
CONSTANT	-2.8182	-6.8146	-0.90186	113.84
	OILPRICE	CONSGROW	IMPORTS	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

OILPRICE	1.0000			
CONSGROW	-0.58525	1.0000		
IMPORTS	0.12741	-0.44706	1.0000	
CONSTANT	-0.48199	-0.15971	-0.35948	1.0000
	OILPRICE	CONSGROW	IMPORTS	CONSTANT

DURBIN-WATSON = 1.37768 VON NEUMANN RATIO = 1.0212 RHO = 0.49275
RESIDUAL SUM = -0.59686E-12 RESIDUAL VARIANCE = 213.87
SUM OF ABSOLUTE ERRORS= 271.81
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7251
RUNS TEST: 7 RUNS, 12 POSITIVE, 11 NEGATIVE, NORMAL STATISTIC = -2.3430

Table 7.4 (cont)
Regression Results of the Simultaneous Equations Model
Saudi Arabia: Equation 4

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = IMPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8015 R-SQUARE ADJUSTED = 0.7817
VARIANCE OF THE ESTIMATE-SIGMA**2 = 49.707
STANDARD ERROR OF THE ESTIMATE-SIGMA = 7.0503
SUM OF SQUARED ERRORS-SSE= 1143.3
MEAN OF DEPENDENT VARIABLE = 32.200

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	0.39317	0.1700	2.313	0.990	0.459	0.3964	0.2726
IMPORTL	0.55649	0.1650	3.373	1.000	0.602	0.5449	0.5161
CONSTANT	6.8053	3.201	2.126	0.983	0.429	0.0000	0.2113

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	0.28892E-01		
IMPORTL	-0.22947E-01	0.27225E-01	
CONSTANT	0.40275E-01	-0.30078	10.244
	NONOIL	IMPORTL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
IMPORTL	-0.81816	1.0000	
CONSTANT	0.74030E-01	-0.56954	1.0000
	NONOIL	IMPORTL	CONSTANT

DURBIN-WATSON = 1.5474 VON NEUMANN RATIO = 1.6177 RHO = 0.20233
RESIDUAL SUM = -0.63949E-13 RESIDUAL VARIANCE = 49.707
SUM OF ABSOLUTE ERRORS= 119.54
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8016
RUNS TEST: 8 RUNS, 11 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -1.9153

Table 7.5
Regression Results of the Simultaneous Equations Model
United Arab Emirates: Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = RBALANCE
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.6867 R-SQUARE ADJUSTED = 0.6553
VARIANCE OF THE ESTIMATE-SIGMA**2 = 32.143
STANDARD ERROR OF THE ESTIMATE-SIGMA = 5.6695
SUM OF SQUARED ERRORS-SSE= 739.28
MEAN OF DEPENDENT VARIABLE = 6.6268

		ASYMPTOTIC					
Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
NONOIL	-0.74357	0.1615	-4.605	0.000	-0.717	-0.5686	-1.2169
WGROWTH	9.8012	2.742	3.575	1.000	0.624	0.4348	0.7009
CONSTANT	10.046	2.726	3.685	1.000	0.636	0.0000	1.5160

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	0.26077E-01		
WGROWTH	0.12457	7.5158	
CONSTANT	-0.34185	-4.9128	7.4332
	NONOIL	WGROWTH	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
WGROWTH	0.28137	1.0000	
CONSTANT	-0.77645	-0.65728	1.0000
	NONOIL	WGROWTH	CONSTANT

DURBIN-WATSON = 1.7205 VON NEUMANN RATIO = 1.7987 RHO = 0.09331
RESIDUAL SUM = 0.65281E-13 RESIDUAL VARIANCE = 32.143
SUM OF ABSOLUTE ERRORS= 106.18
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.6872
RUNS TEST: 12 RUNS, 12 POSITIVE, 11 NEGATIVE, NORMAL STATISTIC = -0.2045

Table 7.5 (cont)
Regression Results of the Simultaneous Equations Model
United Arab Emirates: Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = NONOIL
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.9414 R-SQUARE ADJUSTED = 0.9321
VARIANCE OF THE ESTIMATE-SIGMA**2 = 3.5160
STANDARD ERROR OF THE ESTIMATE-SIGMA = 1.8751
SUM OF SQUARED ERRORS-SSE= 80.868
MEAN OF DEPENDENT VARIABLE = 10.845

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
GEXPEND	1.5346	0.3627	4.231	1.000	0.697	0.5326	0.7440
EXPORTS	0.15871	0.7729E-01	2.053	0.980	0.426	0.1470	0.2774
NONOILL	0.55086	0.1451	3.798	1.000	0.657	0.4749	0.4938
CONSTANT	-5.5874	1.981	-2.821	0.002	-0.543	0.0000	-0.5152

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GEXPEND	0.13154			
EXPORTS	0.16987E-01	0.59738E-02		
NONOILL	-0.48036E-01	-0.67160E-02	0.21040E-01	
CONSTANT	-0.54662	-0:13726	0.17532	3.9242
	GEXPEND	EXPORTS	NONOILL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GEXPEND	1.0000			
EXPORTS	0.60597	1.0000		
NONOILL	-0.91309	-0.59904	1.0000	
CONSTANT	-0.76080	-0.89647	0.61015	1.0000
	GEXPEND	EXPORTS	NONOILL	CONSTANT

DURBIN-WATSON = 2.0135 VON NEUMANN RATIO = 2.1050 RHO = -0.03635
RESIDUAL SUM = 0.63949E-13 RESIDUAL VARIANCE = 3.5160
SUM OF ABSOLUTE ERRORS= 36.076
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.9415
RUNS TEST: 14 RUNS, 12 POSITIVE, 11 NEGATIVE, NORMAL STATISTIC = 0.6508

Table 7.5 (cont)
Regression Results of the Simultaneous Equations Model
United Arab Emirates: Equation 3

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = EXPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7879 R-SQUARE ADJUSTED = 0.7544
VARIANCE OF THE ESTIMATE-SIGMA**2 = 10.909
STANDARD ERROR OF THE ESTIMATE-SIGMA = 3.3028
SUM OF SQUARED ERRORS-SSE= 250.90
MEAN OF DEPENDENT VARIABLE = 18.955

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
			ASYMPTOTIC				
OILPRICE	0.86538	0.1012	8.548	1.000	0.891	0.8426	0.9067
CONSGROW	1.0217	0.3863	2.645	0.996	0.519	0.2759	0.1022
IMPORTS	0.18536	0.1050	1.765	0.961	0.375	0.1940	0.1175
CONSTANT	-2.3949	2.615	-0.9158	0.180	-0.206	0.0000	-0.1263

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

OILPRICE	0.10249E-01			
CONSGROW	-0.30185E-	02 0.14920		
IMPORTS	0.23967E-02	-0.15847E-01	0.11032E-01	
CONSTANT	-0.22661	-0.32548E-01	-0.15006	6.8390
	OILPRICE	CONSGROW	IMPORTS	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

OILPRICE	1.0000			
CONSGROW	-0.77193E-01	1.0000		
IMPORTS	0.22540	-0.39061	1.0000	
CONSTANT	-0.85596	-0.32222E-01	-0.54631	1.0000
	OILPRICE	CONSGROW	IMPORTS	CONSTANT

DURBIN-WATSON = 1.4291 VON NEUMANN RATIO = 1.4941 RHO = 0.27938
RESIDUAL SUM = 0.97700E-14 RESIDUAL VARIANCE = 10.909
SUM OF ABSOLUTE ERRORS= 59.968
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7879
RUNS TEST: 10 RUNS, 12 POSITIVE, 11 NEGATIVE, NORMAL STATISTIC = -1.0599

Table 7.5 (cont)
Regression Results of the Simultaneous Equations Model
United Arab Emirates: Equation 4

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = IMPORTS
6 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
23 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.9656 R-SQUARE ADJUSTED = 0.9621
VARIANCE OF THE ESTIMATE-SIGMA**2 = 1.9384
STANDARD ERROR OF THE ESTIMATE-SIGMA = 1.3923
SUM OF SQUARED ERRORS-SSE= 44.582
MEAN OF DEPENDENT VARIABLE = 12.011

ASYMPTOTIC

Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	P-Value	Partial Corr.	Standardized Coefficient		Elasticity At Means
NONOIL	0.64557	0.1153	5.600	1.000	0.781	0.6663		0.5829
IMPORTL	0.36510	0.1313	2.781	0.997	0.528	0.3259	0.3323	
CONSTANT	1.0184	0.5653	1.801	0.964	0.374	0.0000		0.0848

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

NONOIL	0.13291E-01		
IMPORTL	-0.14289E-01	0.17239E-01	
CONSTANT	0.12043E-01	-0.33477E-01	0.31961
	NONOIL	IMPORTL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

NONOIL	1.0000		
IMPORTL	-0.94395	1.0000	
CONSTANT	0.18477	-0.45101	1.0000
	NONOIL	IMPORTL	CONSTANT

DURBIN-WATSON = 1.6224 VON NEUMANN RATIO = 1.6962 RHO = 0.09719
RESIDUAL SUM = -0.35527E-14 RESIDUAL VARIANCE = 1.9384
SUM OF ABSOLUTE ERRORS= 26.932
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.9656
RUNS TEST: 10 RUNS, 13 POSITIVE, 10 NEGATIVE, NORMAL STATISTIC = -1.0014

Chapter Eight

Trade Relationship Between the GCC and its Major Trading Partners

8.1 Introduction

Any study of foreign trade of the Gulf Cooperation Council (GCC) must take into consideration the interaction between the economies of the GCC and the rest of the world. This interaction can be explained in two ways:

First, the growth in the world economy results in an increase in the demand for oil. An increase in oil exports results in an increase in the incomes of the GCC members. As their income rises, their demand for imports will increase. This represents an increase in the incomes of those countries from which the GCC imports. The rise in income of the GCC trading partners would in turn stimulate their demand for imports, including oil.

Secondly, a rise in oil prices would increase costs of production of the oil importers. This may slow their rates of growth and hence their demand for oil. As a result, GCC exports, and hence its income, decrease.

It follows from the above that trade relationship between the GCC and its major trading partners should be examined by a simultaneous-equations model to capture the feedback effects. These effects may not exist in the case of individual members, due to the relative smallness, and hence impact. However, when taken together as an integration, the GCC exports a substantial proportion of its major trading partners' imports. Also, GCC imports make up a significant part of its trading partners' exports.

The aim of this chapter is to test for feedback effects in GCC trade relationship with its major trading partners. The chapter is divided into five sections. Section two

briefly discusses the trends in GCC trade with its major trading partners. Section three develops a simultaneous equations model to test the process of interaction between the GCC integration and its major trading partners. Section four reports the regression results of the simultaneous equations model. Finally, the main conclusions are summarized in section five.

8.2 Trends in GCC Trade with its Major Trading Partners

GCC trade increased substantially since the sudden and sharp rise in oil prices in late 1973. The downturn in oil prices, which started in late 1982, resulted in a sharp decline in GCC exports. These exports could never reach again their peak level which was achieved in 1981. However the relative stability in oil prices since 1987 (at around $14-$16 a barrel to the end of the sample period) resulted in a steady growth of GCC exports. These exports exceeded 100 billion dollars in 1986. However, as a percentage of GDP, the contribution of oil exports declined sharply as can be seen from the data in Table 8.1. The opposite seems to be true with respect to the contribution of GCC imports to GDP. These imports enjoyed substantial growth during the last quarter of century. Perhaps the most striking fact revealed by the data in Table 8.1 is the growing percentage of exports spent on imports. This percentage increased from less than 30 percent during the boom years (1974-1982) to over 80 percent in 1996. This has resulted in a significant reduction in the trade surplus of the GCC.

Table 8.1: Trends in GCC Trade (1970–1996)

Year	Exports		Imports	
	$billion	% of GDP	$billion	%of GDP
1970	5.064	71.8	1.926	27.3
1975	49.635	66.6	11.702	15.7
1980	160.380	78.9	51.834	25.5
1985	64.843	42.2	44.087	28.4
1990	86.009	49.3	48.700	27.9
1996	101.165	44.7	83.728	37.0

Sources:
GCC (1997), *Economic Bulletin*, Riyadh, GCC General Secretary. Also, various previous issues.
IMF, (1998), *International Financial Statistics Yearbook*, Washington, D.C., International Monetary Fund
------(1997), Direction of Trade Statistics Yearbook, Washington, D.C., International Monetary Fund

The GCC trades mostly with the industrialized countries as can be seen from the data in Table 8.2. This table suggests that the GCC imports over two-thirds of its supplies from the USA, the EU and Japan. The GCC exports well over 55 percent of its total exports to these three regions. Also, each of these trading partners imports over 10 percent of total GCC oil exports and the GCC imports at least 10 percent of its total supplies from each of these partners.

The data in Table 8.2 also suggest that the GCC trade balance with the EU is heavily on the Union's side, while the GCC balance of trade with Japan strongly favors

the GCC. On the other hand, GCC exports to the USA seem to be matching its imports from that country. Finally, the data in Table 8.2 seems to suggest that the GCC directions of trade did not change too much over the last two decades.

Table 8.2: GCC Directions of Trade (percentages)

	USA		EU		Japan		Others	
	X	M	X	M	X	M	X	M
1979	7.2	12.1	17.9	37.6	32.5	19.7	42.4	30.6
1985	10.7	13.2	16.0	36.8	30.3	19.0	43.0	31.0
1990	13.6	15.0	14.8	38.0	27.3	14.0	44.3	33.0
1996	14.2	16.4	14.9	35.8	27.1	12.5	43.8	35.3

Notes:
X = Exports
M = Imports
Sources: As for Table 1

8.3 The GCC Simultaneous Trade Model

The following simultaneous relationships, known as structural equations, has been developed:

Structural equations:

$$GCCX_{j,t} = a_o + a_1 P_t + a_2 R_{j,t} + u_1$$

$$R_{j,t} = b_0 + b_1 R_{j\,Ind,t} + b_2 GCCM_{j,t} + u_2$$

$$GCCM_{j,t} = c_0 + c_1 GCCX_{j,t} + c_2 GCCM_{j,t-1} + u_3$$

Endogenous Variables:

$GCCX_{j,t}$ = Exports of the GCC to its jth trading partner in period t

$R_{j,t}$ = Rate of growth of the jth trading partner in period t

$GCCM_{j,t}$ = GCC imports from its jth trading partner in period t

Predetermined Variables:

P_t = Oil prices in period t

$R_{j\,Ind,\,t}$ = Rate of growth of industrial production of the jth trading partner in period t

$GCCM_{j,\,t-1}$ = GCC imports from the jth trading partner in period t-1

The first equation tests the hypothesis that oil exports to a particular trading partner are determined by the forces of demand for and supply of oil. These forces are reflected in oil prices and the rate of growth of the GDP of the relevant trading partner. It is expected that an increase in oil prices leads to an increase in export proceeds of the GCC, given the quantities exported. It is also expected that a rise in the rate of growth of the major trading partner leads to an increase in its demand for oil, given the price of oil. Thus the two coefficients, a_1 and a_2 are expected to carry a positive sign.

The second equation tests for existence of feedback effects. It assumes that the rate of growth of GDP of the jth major trading partner depends on the rate of growth of its industrial production and on its exports to the GCC (i.e the GCC imports from that

partner). If there is a significant feedback effect, the coefficient b_2 would be statistically significant.

The third equation examines the relationship between the GCC demand for imports and the GCC oil exports within a process of partial adjustment.

The above system is mathematically complete in the sense that it contains as many equations as it contains endogenous variables. Applying the order and rank conditions of identification to our simultaneous equations model, we verify that both conditions hold and each equation is over-identified. Hence the method of two-stage least squares is appropriate to estimate the equations of the model (Charemza and Deadman, 1992).

8.4 The Simultaneous Equations Model Results

The data were extracted from the IMF International Financial Statistics 1998 Yearbook, the International Bank 1997 World Tables, various issues of GCC Economic Bulletins and the Statistical Abstracts of individual GCC countries. The Shazam computer program was used in the estimation (Shazam, 1993). The computer results for the three equations for the three major trading partners are given in Tables 8.3, 8.4, and 8.5. The figures in parentheses represent t-values.

The regression results, in all cases, suggest that the model is a good fit as indicated by the values of (adjusted) R^2 and F statistics. Also, the estimated D-W statistic suggests that there is no serious problem of serial correlation (Kennedy, 1993). Again, it should be noted that the relevant test statistic for serial correlation, in models where the lagged dependent variable is used as an explanatory variable, is Durbin's h and not Durbin – Watson statistic. However, as was mentioned before, the various test statistics are given

for what they are worth since their precise meaning in small sample simultaneous models is arguable (Griffiths et al, 1993).

The statistical results for GCC trade with the USA (Table 8.3) suggest that:

1. There is a significant positive relationship between GCC oil exports and each of oil prices and the rate of growth of GDP of the USA. The t values of the two variables (equation 1) are significant beyond the 1 per cent level of significance.

2. The performance of the industrial sector exerts a significant influence on the growth of the USA. The coefficient of the variable RSIND (equation 2), is positive and highly significant.

3. The data in Table 8.3 suggest that there is a significant feedback effect in the relationship between the rate of growth of the USA and the GCC demand for imports. The coefficient b_2 in the second equation is positive and statistically significant suggesting that GCC spending on imports from the USA promotes growth in that country, which, in turn increases GCC oil exports to the USA.

4. The data in Table 8.3 (equation 3) suggest that oil exports to the USA are a major determinant of spending on GCC imports from this country. The "t" value of the coefficient of the variable "GCCXS", which represents GCC exports to the USA, is significant beyond the 1 per cent level of significance. The short-term marginal propensity of the GCC imports from the USA with respect to the GCC oil exports to the same country is 0.527, while its long-run counterpart is 0.839. The short-run

elasticity of these imports, at the mean value, is approximately 0.798, while the long-term elasticity is 1.219.

5. The significance of the coefficient of the lagged dependent variable suggests that the dependence of GCC demand for imports from the USA on oil exports to that country is subject to a significant partial adjustment mechanism. The coefficient of the lagged variable (GCCMSL) lies between zero and one. The value of this coefficient (0.37177) suggests that approximately 0.62823 of the gap between the desired level of spending on imports from the USA and the actual level of spending will be closed in one period and the number of periods of adjustment is approximately 1.59 years.

The regression results for trade between the GCC and the Economic Union (Table 8.4) suggest that:

1. Both oil prices and growth in the EU exert a significant positive influence on GCC exports to the EU. The t values of the variables P and REU (equation 1) are significant beyond the 1 per cent level of significance.

2. As with the USA, the performance of the industrial sector in the EU exerts a significant influence on the growth of the Union. The coefficient of the variable REUIND (equation 2), is positive and highly significant

3. The data in Table 8.4 suggest that there is a significant feedback effect in the trade relationship between the GCC and the EU. The coefficient b_2 in the second equation is positive and statistically significant suggesting that GCC spending on imports from the EU promotes growth in the Union, which in turn increases the Union's oil imports from the GCC.

4. The data in Table 8.4 (equation 3) suggest that oil exports to the EU are a major determinant of spending on GCC imports from the EU. The "t" value of the coefficient of the variable "GCCXEU" which represents GCC exports to the EU is significant beyond the 1 per cent level of significance. The short-term marginal propensity of GCC imports from the EU with respect to GCC exports to that region is 0.407, while its long-run counterpart is 0.7644. The short-run elasticity of GCC imports from the EU with respect to GCC oil exports to that region, at the mean values, is approximately 0.3502, while the long-term elasticity is 1.2739. Thus the short-term elasticity of the GCC imports from the EU (with respect to the GCC exports to the EU) is less than the short-term elasticity of the GCC imports from the USA (with respect to GCC exports to the USA). However, the long-term elasticity of the GCC imports from the two regions are very close.

5. The significance of the coefficient of the lagged dependent variable (equation 3) also suggests that the dependence of GCC demand for imports from the EU on GCC exports to the EU is subject to a significant partial adjustment mechanism. The coefficient of the lagged variable (GCCMEUL) lies between zero and one. The

value of this coefficient (0.76411) suggests that approximately 0.24 of the gap between the desired level of GCC spending on imports from the EU and the actual level of spending will be closed in one period and the number of periods of adjustment is approximately 4.17 years. Thus, the speed of adjustment is greater in the case of GCC imports from the USA than its imports from the EU.

The regression results for trade between the GCC and Japan (Table 8.5) suggest that:

1. A high rate of growth in the Japanese economy leads to an increase in the GCC exports to Japan. The t value of the variable RJ (equation 1) is significant beyond the 5 per cent level of significance.

2. As with the USA and the EU, the performance of the industrial sector in Japan exerts a significant influence on the growth of the GDP in this country. The coefficient of the variable RJ (equation 2), is positive and highly significant

3. The data in Table 8.5 suggest that there is a significant feedback effect in the trade relationship between the GCC and Japan. The coefficient b_2 in the second equation is positive and statistically significant suggesting that GCC spending on imports from Japan promotes growth in Japan, which, in turn increases Japanese oil imports from the GCC.

4. The data in Table 8.5 (equation 3) suggest that GCC exports to Japan is a major determinant of spending on GCC imports from Japan. The "t" value of the

coefficient of the variable "GCCXJ" which represents GCC exports to the EU is significant beyond the 1 per cent level of significance. The short-term marginal propensity of GCC imports from Japan (with respect to the GCC exports to that country) is 0.161 while its long-run counterpart is 0.289. The short-run elasticity of GCC imports from Japan with respect to GCC exports to that country, at the mean values, is approximately 0.455, while the long-term elasticity is approximately 0.790. Thus, the short-run elasticity of the GCC imports from Japan (with respect to the GCC exports to that country) is less than the short-run elasticity of the GCC imports from the USA but greater than the short-run GCC elasticity of the GCC imports from the EU. However, the long-term elasticity of the GCC imports from Japan is less than the long-term elasticity of the GCC imports from the USA and the EU.

5. The significance of the coefficient of the lagged dependent variable (equation 5) also suggests that the dependence of GCC demand for imports from Japan on GCC exports to that country is subject to a significant partial adjustment mechanism. The coefficient of the lagged variable (GCCMJL) lies between zero and one. The value of this coefficient (0.44264) suggests that approximately 0.56 of the gap between the desired level of GCC spending on imports from the EU and the actual level of spending will be closed in one period and the number of periods of adjustment is approximately 1.8 years. Thus, the speed of adjustment is greater in the case of GCC imports from Japan than the GCC imports from the EU but less than the speed of adjustment of GCC imports from the USA.

Table 8.3

Regression Results of Trade Relationship with USA

Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = GCCXS
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8732 R-SQUARE ADJUSTED = 0.8617
VARIANCE OF THE ESTIMATE-SIGMA**2 = 2.6010
STANDARD ERROR OF THE ESTIMATE-SIGMA = 1.6128
SUM OF SQUARED ERRORS-SSE= 65.025
MEAN OF DEPENDENT VARIABLE = 9.1161

		ASYMPTOTIC					
Variable	Estimated	Standard	T-Ratio	Partial	Standardized		Elasticity
Name	Coefficient	Error	***** DF	P-value	Corr.	Coefficient	At Means
P	0.30743	0.4252E-01	7.231	1.000	0.839	0.5595	0.6140
RS	2.5485	0.3597	7.085	1.000	0.834	0.7106	0.4529
CONSTANT	-0.61012	0.8306	-0.7346	0.231	-0.155	0.0000	-0.0669

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

P	0.18077E-02		
RS	-0.59837E-02	0.12937	
CONSTANT	-0.23222E-01	-0.10064	0.68989
	P	RS	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

P	1.0000		
RS	-0.39127	1.0000	
CONSTANT	-0.65756	-0.33685	1.0000
	P	RS	CONSTANT

DURBIN-WATSON = 1.2797 VON NEUMANN RATIO = 1.1247 RHO = 0.44958
RESIDUAL SUM = -0.52403E-13 RESIDUAL VARIANCE = 2.6010
SUM OF ABSOLUTE ERRORS= 32.871
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8813
RUNS TEST: 8 RUNS, 12 POSITIVE, 13 NEGATIVE, NORMAL STATISTIC = -2.2429

Table 8.3 (cont.)

Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = RS
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7924 R-SQUARE ADJUSTED = 0.7735
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.33113
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.57544
SUM OF SQUARED ERRORS-SSE= 8.2784
MEAN OF DEPENDENT VARIABLE = 1.6200

Variable Name	Estimated Coefficient	Standard Error	T-ratio ***** DF	Partial P-Value	Standardized Corr. Coefficient		Elasticity At Means
			ASYMPTOTIC				
RSIND	0.45176	0.1259	3.587	1.000	0.607	0.3838	0.6392
GCCMS	0.18780	0.4060E-01	4.626	1.000	0.702	0.5765	0.6977
CONSTANT	-0.54566	0.2870	-1.901	0.029	-0.376	0.0000	-0.3368

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

RSIND	0.15860E-01		
GCCMS	-0.26787E-02	0.16483E-02	
CONSTANT	-0.20229E-01	-0.37803E-02	0.82361E-01
	RSIND	GCCMS	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

RSIND	1.0000		
GCCMS	-0.52391	1.0000	
CONSTANT	-0.55972	-0.32445	1.0000
	RSIND	GCCMS	CONSTANT

DURBIN-WATSON = 1.3133 VON NEUMANN RATIO = 1.1803 RHO = 0.39059
RESIDUAL SUM = -0.24425E-14 RESIDUAL VARIANCE = 0.33113
SUM OF ABSOLUTE ERRORS= 10.794
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7972
RUNS TEST: 7 RUNS, 14 POSITIVE, 11 NEGATIVE, NORMAL STATISTIC = -2.6218

Table 8.3 (cont.)

Equation 3

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = GCCMS
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7382 R-SQUARE ADJUSTED = 0.7144
VARIANCE OF THE ESTIMATE-SIGMA**2 = 3.9356
STANDARD ERROR OF THE ESTIMATE-SIGMA = 1.9838
SUM OF SQUARED ERRORS-SSE= 98.390
MEAN OF DEPENDENT VARIABLE = 6.0183

			ASYMPTOTIC				
Variable	Estimated	Standard	T-Ratio	Partial	Standardized		Elasticity
Name	Coefficient	Error	***** DF	P-Value	Corr.	Coefficient	At Means
GCCXS	0.52703	0.1182	4.460	1.000	0.689	0.6157	0.7983
GCCMSL	0.37177	0.1372	2.709	0.997	0.500	0.3476	0.3450
CONSTANT	-0.86251	0.9535	-0.9045	0.183	-0.189	0.0000	-0.1433

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GCCXS	0.13963E-01		
GCCMSL	-0.97806E-02	0.18831E-01	
CONSTANT	-0.72664E-01	-0.16010E-01	0.90925
	GCCXS	GCCMSL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GCCXS	1.0000		
GCCMSL	-0.60317	1.0000	
CONSTANT	-0.64490	-0.12235	1.0000
	GCCXS	GCCMSL	CONSTANT

DURBIN-WATSON = 1.3688 VON NEUMANN RATIO = 1.4258 RHO = 0.26005
RESIDUAL SUM = 0.21316E-13 RESIDUAL VARIANCE = 3.9356
SUM OF ABSOLUTE ERRORS= 39.014
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7382 RUNS TEST: 13 RUNS, 13 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -0.1965

Table 8.4

Regression Results of Trade Relationship with the Economic Union

Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = GCCXEU
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7367 R-SQUARE ADJUSTED = 0.7128
VARIANCE OF THE ESTIMATE-SIGMA**2 = 7.0703
STANDARD ERROR OF THE ESTIMATE-SIGMA = 2.6590
SUM OF SQUARED ERRORS-SSE= 176.76
MEAN OF DEPENDENT VARIABLE = 12.145

Variable Name	Estimated Coefficient	ASYMPTOTIC Standard Error	T-Ratio ***** DF	Partial P-Value	Corr.	Standardized Coefficient	Elasticity At Means
P	0.37887	0.6922E-01	5.473	1.000	0.759	0.6027	0.5680
REU	1.7600	0.5425	3.244	0.999	0.569	0.4289	0.3797
CONSTANT	0.63523	1.610	0.3945	0.653	0.084	0.0000	0.0523

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

P	0.47914E-02		
REU	-0.13614E-01	0.29435	
CONSTANT	-0.51572E-01	-0.52332	2.5929
	P	REU	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

P	1.0000		
REU	-0.36252	1.0000	
CONSTANT	-0.46269	-0.59901	1.0000
	P	REU	CONSTANT

DURBIN-WATSON = 1.3389 VON NEUMANN RATIO = 1.0822 RHO = 0.47304
RESIDUAL SUM = -0.90594E-13 RESIDUAL VARIANCE = 7.0703
SUM OF ABSOLUTE ERRORS= 56.406
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7371
RUNS TEST: 5 RUNS, 11 POSITIVE, 14 NEGATIVE, NORMAL STATISTIC = -3.4514

Table 8.4 (cont.)

Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = REU
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.7038 R-SQUARE ADJUSTED = 0.6769
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.47246
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.68736
SUM OF SQUARED ERRORS-SSE= 11.812
MEAN OF DEPENDENT VARIABLE = 2.6200

Variable Name	Estimated Coefficient	Standard Error	ASYMPTOTIC T-Ratio ***** DF	Partial P-Value	Standardized Corr.	Coefficient	Elasticity At Means
REUIND	0.66805	0.1295	5.159	1.000	0.740	0.5675	0.8394
GCCMEU	0.11246	0.2370E-01	4.744	1.000	0.711	0.5636	0.6054
CONSTANT	-1.1654	0.5207	-2.238	0.013	-0.431	0.0000	-0.4448

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

REUIND	0.16768E-01		
GCCMEU	-0.44421E-03	0.56189E-03	
CONSTANT	-0.48937E-01	-0.64628E-02	0.27115
	REUIND	GCCMEU	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

REUIND	1.0000		
GCCMEU	-0.14472	1.0000	
CONSTANT	-0.72574	-0.52359	1.0000
	REUIND	GCCMEU	CONSTANT

DURBIN-WATSON = 1.2910 VON NEUMANN RATIO = 1.3448 RHO = 0.33788
RESIDUAL SUM = 0.23870E-13 RESIDUAL VARIANCE = 0.47246
SUM OF ABSOLUTE ERRORS= 12.692
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7040
RUNS TEST: 8 RUNS, 14 POSITIVE, 11 NEGATIVE, NORMAL STATISTIC = -2.2069

Table 8.4 (cont.)

Equation 3

2SLS GCCMEU GCCXEU GCCMEUL (P REUIND GCCMEUL)/DN MAX
TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = GCCMEU
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8367 R-SQUARE ADJUSTED = 0.8219
VARIANCE OF THE ESTIMATE-SIGMA**2 = 6.5422
STANDARD ERROR OF THE ESTIMATE-SIGMA = 2.5578
SUM OF SQUARED ERRORS-SSE= 163.56
MEAN OF DEPENDENT VARIABLE = 14.104

Variable Name	Estimated Coefficient	Standard Error	ASYMPTOTIC T-Ratio ***** DF	Partial P-Value	Standardized Corr. Coefficient	Elasticity At Means
GCCXEU	0.40665	0.1215	3.346	1.000	0.581 0.3329	0.3502
GCCMEUL	0.76411	0.8025E-01	9.522	1.000	0.897 0.7992	0.7251
CONSTANT	-1.0611	1.654	-0.6414	0.261	-0.135 0.0000	-0.0752

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GCCXEU	0.14774E-01		
GCCMEUL	-0.26362E-02	0.64394E-02	
CONSTANT	-0.14414	-0.54169E-01	2.7373
	GCCXEU	GCCMEUL	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GCCXEU	1.0000		
GCCMEUL	-0.27028	1.0000	
CONSTANT	-0.71678	-0.40801	1.0000
	GCCXEU	GCCMEUL	CONSTANT

DURBIN-WATSON = 1.7699 VON NEUMANN RATIO = 1.8436 RHO = 0.11047
RESIDUAL SUM = 0.10658E-13 RESIDUAL VARIANCE = 6.5422
SUM OF ABSOLUTE ERRORS= 47.082
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8371
RUNS TEST: 17 RUNS, 12 POSITIVE, 13 NEGATIVE, NORMAL STATISTIC = 1.4407

Table 8.5

Regression Results of Trade Relationship with Japan

Equation 1

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = GCCXJ
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8322 R-SQUARE ADJUSTED = 0.8169
VARIANCE OF THE ESTIMATE-SIGMA**2 = 13.716
STANDARD ERROR OF THE ESTIMATE-SIGMA = 3.7035
SUM OF SQUARED ERRORS-SSE= 342.91
MEAN OF DEPENDENT VARIABLE = 23.051

Variable Name	Estimated Coefficient	Standard Error	ASYMPTOTIC T-Ratio ***** DF	Partial P-value	Standardized Corr.	Coefficient	Elasticity At Means
P	0.72346	0.1257	5.756	1.000	0.775	0.6597	0.5714
RJ	1.9488	0.8602	2.266	0.988	0.435	0.3448	0.2881
Constant	3.2373	2.235	1.448	0.926	0.295	0.0000	0.1404

Variance-Covariance Matrix of Coefficients

	P	RJ	Constant
P	0.15798E-01		
RJ	-0.75599E-01	0.73988	
Constant	-0.30010E-01	-1.1450	4.9973

CORRELATION MATRIX OF COEFFICIENTS

	P	RJ	CONSTANT
P	1.0000		
RJ	-0.69925	1.0000	
CONSTANT	-0.10681	-0.59547	1.0000

DURBIN-WATSON = 1.3667 VON NEUMANN RATIO = 1.2153 RHO = 0.40036
RESIDUAL SUM = -0.11369E-12 RESIDUAL VARIANCE = 13.716
SUM OF ABSOLUTE ERRORS= 74.060
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8326
RUNS TEST: 12 RUNS, 12 POSITIVE, 13 NEGATIVE, NORMAL STATISTIC = -0.6057

Table 8.5 (cont.)

Equation 2

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = RJ
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.6307 R-SQUARE ADJUSTED = 0.5972
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.94503
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.97213
SUM OF SQUARED ERRORS-SSE= 23.626
MEAN OF DEPENDENT VARIABLE = 3.4080

		ASYMPTOTIC					
Variable Name	Estimated Coefficient	Standard Error	T-Ratio ***** DF	Partial P-Value	Corr.	Standardized Coefficient	Elasticity At Means
RJIND	1.0253	0.3720	2.756	0.997	0.507	0.4138	0.6498
GCCMJ	0.26926	0.9476E-01	2.842	0.998	0.518	0.4675	0.6438
CONSTANT	-1.0006	0.7425	-1.348	0.089	-0.276	0.0000	-0.2936

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

RJIND	0.13837		
GCCMJ	-0.20690E-01	0.89794E-02	
CONSTANT	-0.13029	-0.28476E-01	0.55124
	RJIND	GCCMJ	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

RJIND	1.0000		
GCCMJ	-0.58698	1.0000	
CONSTANT	-0.47174	-0.40474	1.0000
	RJIND	GCCMJ	CONSTANT

DURBIN-WATSON = 1.3115 VON NEUMANN RATIO = 1.0537 RHO = 0.48971
RESIDUAL SUM = 0.15987E-13 RESIDUAL VARIANCE = 0.94503
SUM OF ABSOLUTE ERRORS= 18.987
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.6312
RUNS TEST: 8 RUNS, 13 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -2.2429

Table 8.5 (cont.)

Equation 3

TWO STAGE LEAST SQUARES - DEPENDENT VARIABLE = GCCJM
3 EXOGENOUS VARIABLES
2 POSSIBLE ENDOGENOUS VARIABLES
25 OBSERVATIONS
DN OPTION IN EFFECT - DIVISOR IS N

R-SQUARE = 0.8701 R-SQUARE ADJUSTED = 0.8583
VARIANCE OF THE ESTIMATE-SIGMA**2 = 1.0021
STANDARD ERROR OF THE ESTIMATE-SIGMA = 1.0011
SUM OF SQUARED ERRORS-SSE= 25.053
MEAN OF DEPENDENT VARIABLE = 8.1482

Variable Name	Estimated Coefficient	ASYMPTOTIC Standard Error	***** T-Ratio DF	P-Value	Partial Corr.	Standardized Coefficient	Elasticity At Means
GCCJX	0.16101	0.5152E-01	3.125	0.999	0.554	0.5240	0.4555
GCCJML	0.44264	0.1313	3.370	1.000	0.584	0.4879	0.4237
CONSTANT	0.98432	0.6244	1.576	0.943	0.319	0.0000	0.1208

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

GCCJX	0.26544E-02		
GCCJML	-0.58677E-02	0.17248E-01	
CONSTANT	-0.15420E-01	0.72666E-03	0.38988
	GCCJX	GCCJML	CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

GCCJX	1.0000		
GCCJML	-0.86719	1.0000	
CONSTANT	-0.47934	0.88613E-02	1.0000
	GCCJX	GCCJML	CONSTANT

DURBIN-WATSON = 1.8374 VON NEUMANN RATIO = 1.9139 RHO = 0.02007
RESIDUAL SUM = 0.33751E-13 RESIDUAL VARIANCE = 1.0021
SUM OF ABSOLUTE ERRORS= 20.163
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.8703
RUNS TEST: 12 RUNS, 13 POSITIVE, 12 NEGATIVE, NORMAL STATISTIC = -0.6057

8.5 Conclusions

The main findings of this chapter may be summarized in the following:

1. The GCC integration, taken as a whole, is a major economic power with significant effects on its major trading partners. Total trade of the integration with the rest of the world exceeded 200 billion dollars in 1997.

2. The major trading partners of the GCC are the EU, the USA and Japan. These three regions import well over 50 percent of total GCC exports (mainly oil). These partners also supply approximately 62 percent of total GCC imports.

3. There is a strong economic interaction between the GCC and its major trading partners. This process of interaction has been examined in terms of a simultaneous equations model which aims at finding out if there are any significant feedback effects.

4. The regression results suggest that GCC exports to each of its three major trading partners are strongly influenced by oil prices and growth of GDP in the trading partner. The simultaneous-equations regression results also suggest that GCC imports from each trading partner is positively related to the GCC exports to the specific partner within a partial adjustment mechanism.

5. The regression results suggest that the short-run marginal propensity of GCC imports from Japan (with respect to the GCC exports to Japan) is much less than the short-run marginal propensity of imports of the GCC from both the USA and the EU (with respect to the GCC exports to these two regions). The long-run marginal propensity of the GCC imports from the EU is greater than that for imports from Japan and the latter is greater than that for imports from the USA. The results also suggest that the short-run elasticity of the GCC imports from Japan (with respect to the GCC exports to that country) is less than the short-run elasticity of the GCC imports from the USA but greater than the short-run GCC elasticity of the GCC imports from the EU. However, the long-term elasticity of the GCC imports from Japan is less than the long-term elasticity of the GCC imports from the USA and the EU.

6. The simultaneous-equations model results indicate that there are very significant feedback effects in GCC trade with the USA, the EU and Japan. These feedback effects may be due to the relatively large size of total GCC imports from and exports to each of these regions.

7. While trade of each separate member of the GCC with the USA, the EU and Japan may not generate any significant feedback effects due to the relatively small size of each member, when taken together, as one integration, these members seem to have a strong impact on the major economic powers.

Chapter Nine

Scenarios of Future Impact of Oil Revenues on the Balance of Payments of the GCC Countries

9.1 Introduction

The impact of fluctuations on oil revenue on the balance of payments of the GCC countries has been a major concern to most, if not all, these countries. The oil revenue obtained at any time period depends on the quantity exported and the world price per barrel. As we have seen, oil prices are determined by the supply of and demand for oil on the international market. There are, however, some unique forces which exert their influences on both the supply and demand for this particular commodity. First, there is the OPEC cartel which was very effective, contributing well over one-third of total oil supply until late 1982. Secondly, the sharp and sudden jumps in the price of oil, beginning with the oil embargo in November 1973, made it profitable for large scale new oil discoveries, production and exportation in many non-OPEC countries. Thirdly, many traditional buyers of GCC oil became self-sufficient or even major exporters (e.g. UK). The increase in oil production and exports of the non-OPEC countries resulted in a sharp decline in OPEC share, which virtually stripped the cartel of the powers, it enjoyed during the seventies and early eighties. The year 1982 brought OPEC to the brink. Oil prices fell sharply (reaching less than $8 per barrel in 1986). To stabilize these prices at a reasonable level, OPEC decided to impose quotas by substantially cutting the supply of its members. Both the adverse price and quantity effects resulted in a sharp reduction in the oil revenues of the

members of the GCC and an adverse impact on their balances of payments (Metwally, 1993).

The regression results of the simultaneous equations models which were developed and tested to examine the impact of the external and internal forces on GCC members' balances of payments are used in forecasting the future behavior of these balances under various scenarios (Davidson and Mackinnon, 1993).

This chapter is divided into five sections. Section two discusses the various scenarios and assumptions used in the forecasting. Section three lists the results of the models which will be used in the forecasting of the behavior of the resource balance of the GCC economies. Section four outlines the results of the forecasting. Finally, section five summarizes the main conclusions of the study.

9.2 The Scenarios

The future impact of the fluctuations in oil revenue on the resource balance of the GCC countries is examined under three scenarios. The first scenario assumes a constant price of oil. However, World growth and consumption of major trading partners are assumed to continue at their current levels. This is likely to promote oil exports despite the assumption of stagnation in oil prices (Metwally, 1987). Government expenditure, which is the main vehicle of economic growth in the GCC countries, are assumed to grow, even during periods of constant oil prices (Metwally and Perrera, 1995). This is likely to put pressure on the balance of payments through increases in imports of goods and services as a

consequence of the rise in non-oil income (Shapiro, 1995). The deficit may be financed by drawing on accumulated reserves.

The second scenario is an optimistic forecast. It assumes that the price of oil will rise steadily during the next five years and international growth rates would be relatively high. It is also assumed that the GCC governments will not unduly increase their spending in the light of the improvement in the market conditions for oil. Thus, it is assumed that government expenditure (for both consumption and investment purposes) will continue to grow at the same rate.

The third scenario is a pessimistic forecast which assumes that oil prices will decline continuously over the next five years. These unfavorable market conditions for oil are also assumed to be combined with slow growth in the world economy. The GCC governments are expected to react quickly to these unfavorable conditions by cutting their spending, particularly on investment and infrastructure.

All three scenarios assume no change in the current export quotas of oil imposed by the OPEC organization. However, Oman is not a member of OPEC and can, at least theoretically, increase its oil revenue by increasing the volume of oil exports. The following is an outline of the assumptions of the three scenarios.

Scenario I:

A price of oil of $18 per barrel, an annual rate of growth in world income of 1 percent, a rate of growth of the economies of major trading partners at 3 percent and a rate of growth of government expenditure of 3 percent.

Scenario II:

A rise in the price of oil by 5 percent per annum during the next 5 years combined with an annual rate of growth in world income of 2 percent, an annual rate of growth of the economies of the major trading partners of 4 percent and an annual rate of growth in government expenditure of 3 percent.

Scenario III:

A reduction in the price of oil by 5 percent per annum during the next 5 years combined with an annual rate of growth in world income of only 5 percent, an annual rate of growth of the economies of the major trading partners of 2.5 percent and an annual rate of growth in government expenditure of 2 percent.

9.2.1 The Simultaneous-equations Model Used in Forecasting

The regression results achieved previously on the determinants of the resource balance of the GCC countries are used in forecasting the future impact of the fluctuations in oil revenue on these balances. These regression results are summarized in Table 9.1.

The first equation expresses the relationship between the resource balance of each GCC country, the non-oil income of that country, and the growth in the world economy. This balance is negatively related with the non-oil income in all countries and positively correlated with the growth in the world economy.

The second equation in the system outlines the relationship between non-oil income, exports, and government expenditure (on consumption and investment). Non-oil income is positively correlated to both exports and government expenditure in all GCC countries and is subject to a process of partial adjustment which is captured through the introduction of the lagged variable $Q_{i,t-1}$.

The third equation sets the forces which determine the exports of goods and services of the GCC countries. These include oil prices, growth in oil consumption of the major trading partners of the ith GCC country and the feedback effect created by the imports of the GCC country from these partners. Oil prices exert a strong influence on the exports of the GCC countries. These exports are also influenced by the growth in the consumption of

the major trading partners of the particular GCC member. There is, however, no evidence of feedback effects in all cases. The coefficient of the variable representing imports was not statistically significant in all cases. Hence the null hypothesis that this coefficient is zero can not be rejected.

The fourth equation determines the demand for imports as a function of non-oil income which measures the domestic ability to spend on imports, (Metwally and Tamaschke, 1980). It is well-known that the GCC economies rely heavily on the outside world for the supply of most of their needs, whether foodstuffs, consumer manufactured goods, raw materials (with the exception of oil), capital goods and invisible products. This is mainly due to the economies' week capacity to produce goods locally because of lack of inputs and domestic markets. The import-income relationship is assumed to follow a partial adjustment mechanism.

Table 9.1: Econometric Models of Forecasting

1. Kuwait

$(X - M)_t = 11.116 - 0.97637\ Q_t + 6.2782\ W_t$

$Q_t = -2.4811 + 0.87332\ G_t + 0.11401\ X_t + 0.27645\ Q_{t-1}$

$X_t = 1.7015 + 0.58642\ P_t + 1.4076\ C_t - 0.34544\ M_t$

$M_t = 1.877 + 0.48006\ Q_t + 0.33392\ M_{t-1}$

2. Oman

$(X - M)_t = 0.52212 - 0.28496\ Q_t + 0.92401\ W_t$

$Q_t = -0.2422 + 0.48668\ G_t + 0.10249\ X_t + 0.51856\ Q_{t-1}$

$X_t = -1.0664 + 0.12616\ P_t + 0.39149\ C_t + 0.11225\ M_t$

$M_t = .08566 + .55588\ Q_t + 0.46032\ M_{t-1}$

3. Saudi Arabia

$(X - M)_t = 18.062 - 0.82046\ Q_t + 44.397\ W_t$

$Q_t = -0.9321 + 0.38219\ G_t + 0.01237\ X_t + 0.66418\ Q_{t-1}$

$X_t = -14.911 + 2.7211\ P_t + 8.0472\ C_t - 0.28579\ M_{it}$

$M_t = 6.8053 + 0.39317\ Q_t + 0.55649\ M_{t-1}$

4. The United Arab Emirates

$(X - M)_t = 0.046 - 0.74357\ Q_t + 9.8012\ W_t$

$Q_t = -5.5874 + 1.5346\ G_t + 0.15871\ X_t + 0.55086\ Q_{t-1}$

$X_t = -2.3949 + 0.86538\ P_t + 1.0217\ C_t + 0.18536\ M_{it}$

$M_t = 1.0184 + 0.64557\ Q_t + 0.36510\ M_{t-1}$

Variables:

$(X - M)_{it}$ = Resource balance of the ith member in period t

Q_{it} = Non-oil income of the ith member in period t

X_{it} = Exports of goods and services of the ith member in period t

M_{it} = Imports of goods and services of the ith member in period t

G_{it} = Government expenditure of the ith member in period t

P_t = Oil prices in period t

W_{it} = Rate of growth of world income in period t

C_t = Growth in oil consumption of major trading partners in period t

$M_{i,t-1}$ = Imports of the ith member in period t-1

$Q_{i,t-1}$ = Non-oil income of the ith member in period t-1

9.3 Results of the Simultaneous-equations Forecasting Model

Applying the econometric models of simultaneous equations and the assumptions made above about the future behavior of oil prices, world growth, the growth of oil consumption in the major trading partners, and government expenditure, we obtained the results of the three scenarios for Kuwait, Oman. Saudi Arabia and the United Arab Emirates respectively. The forecasting results are given in Tables 9.2 to 9.5. The figures related to the resource balance have been illustrated graphically in order to compare the behavior of these balances under various scenarios.

Table 9.2: Scenarios of Future Behavior of the Resource Balance of the GCC Countries

Kuwait
(US$b)

Year	Non-oil Income	Exports of of Goods &	Imports of Goods &	Resource Balance
1999	13.654	16.391	12.328	4.063
Scenario I				
2000	13.972	16.483	12.540	3.843
2001	14.402	16.521	12.808	3.713
2002	14.906	16.687	13.198	3.489
2003	15.587	16.737	13.556	3.181
2004	16.278	16.841	13.962	2.880
2005	16.982	16.951	14.475	2.476
Scenario II				
2000	14.007	16.921	12.631	4.290
2001	14.451	17.597	12.977	4.620
2002	15.012	18.688	13.386	5.302
2003	15.699	19.684	13.830	5.854
2004	16.497	20.903	14.505	6.398
2005	17.313	22.345	15.306	7.039
Scenario III				
2000	13.856	16.091	12.401	3.690
2001	14.207	15.493	12.691	2.802
2002	14.335	14.727	12.984	1.734
2003	14.421	14.065	13.169	0.896
2004	14.501	13.162	13.235	-0.073
2005	14.582	12.290	13.396	-1.106

Table 9.3: Scenarios of Future Behavior of the Resource Balance of the GCC Countries

Oman
(US$b)

Year	Non-oil Income	Exports of of Goods &	Imports of Goods &	Resource Balance
1999	4.406	6.165	4.376	1.789
Scenario I				
2000	4.479	6.230	4.501	1.729
2001	4.683	6.418	4.764	1.654
2002	4.855	6.554	4.980	1.574
2003	5.108	6.663	5.165	1.498
2004	5.395	6.743	5.337	1.406
2005	5.501	6.837	5.550	1.287
Scenario II				
2000	4.635	6.686	4.788	1.898
2001	4.813	7.058	5.004	2.054
2002	5.071	7.503	5.339	2.164
2003	5.305	8.070	5.588	2.482
2004	5.667	8.683	5.808	2.875
2005	5.999	9.368	5.912	3.456
Scenario III				
2000	4.574	5.980	4.343	1.637
2001	4.691	5.732	4.431	1.301
2002	4.782	5.475	4.567	0.908
2003	4.861	5.122	4.707	0.415
2004	4.935	4.893	4.864	0.029
2005	5.007	4.589	5.056	-0.467

Table 9.4: Scenarios of Future Behavior of the Resource Balance of the GCC Countries

Saudi Arabia
(US$b)

Year	Non-oil Income	Exports of of Goods &	Imports of Goods &	Resource Balance
1999	50.897	59.485	48.524	10.961
Scenario I				
2000	53.316	59.669	49.102	10.567
2001	55.764	59.893	49.819	10.074
2002	57.036	60.099	50.715	9.384
2003	58.499	60.287	51.753	8.534
2004	59.825	60.998	53.811	7.187
2005	60.537	61.358	54.933	6.425
Scenario II				
2000	53.979	62.059	50.704	11.355
2001	56.868	65.187	51.605	13.582
2002	59.036	69.177	54.011	15.166
2003	63.423	74.176	57.753	16.423
2004	68.417	80.498	62.139	18.359
2005	77.034	88.042	67.973	21.069
Scenario III				
2000	52.856	58.465	48.531	9.934
2001	53.057	56.014	49.444	6.570
2002	53.556	54.006	50.315	3.691
2003	54.084	52.298	50.997	1.301
2004	54.669	50.713	51.335	-0.622
2005	55.060	47.833	51.646	-3.813

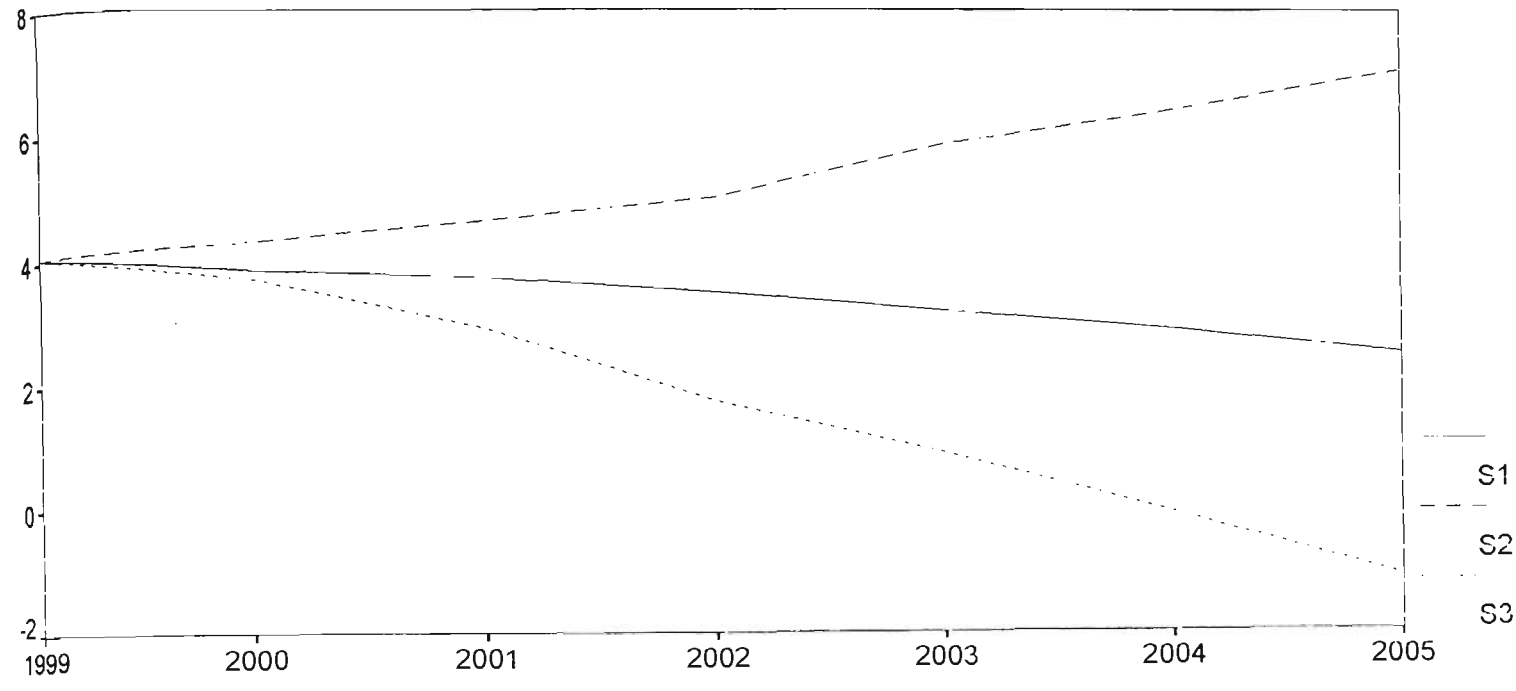
Table 9.5: Scenarios of Future Behavior of the Resource Balance of the GCC Countries

United Arab Emirates
(US$b)

Year	Non-oil Income	Exports of of Goods &	Imports of Goods &	Resource Balance
1999	27.288	32.061	27.063	4.998
Scenario I				
2000	27.440	32.228	27.491	4.737
2001	27.682	31.467	27.893	4.574
2002	28.098	32.743	28.419	4.324
2003	28.564	33.176	29.171	4.005
2004	29.130	33.710	29.998	3.712
2005	29.831	34.170	30.782	3.388
Scenario II				
2000	27.791	33.322	27.943	5.379
2001	28.020	34.346	28.368	5.978
2002	28.643	36.178	29.264	6.914
2003	29.375	38.241	30.177	8.064
2004	30.112	40.777	31.548	9.229
2005	30.996	42.594	32.623	9.971
Scenario III				
2000	26.694	31.357	26.993	4.364
2001	26.981	30.778	27.100	3.678
2002	27.203	29.770	27.348	2.422
2003	27.553	28.993	27.681	1.312
2004	27.960	27.799	27.974	-0.175
2005	28.033	26.901	28.334	-1.433

Scenarios for Kuwaiti Resource Balance

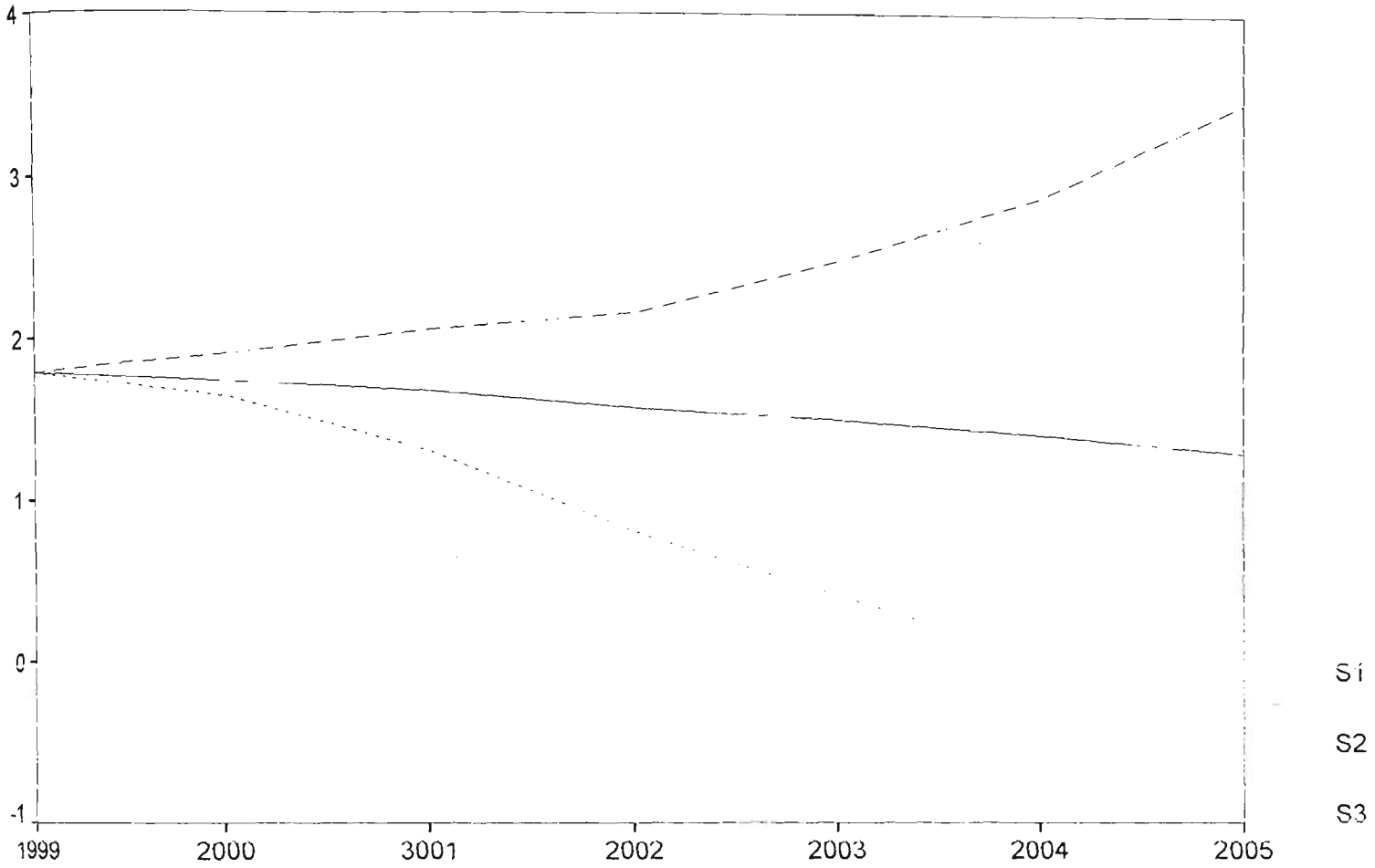
Billions of US Dollars



YEAR

Scenarios for Omani Resource Balance

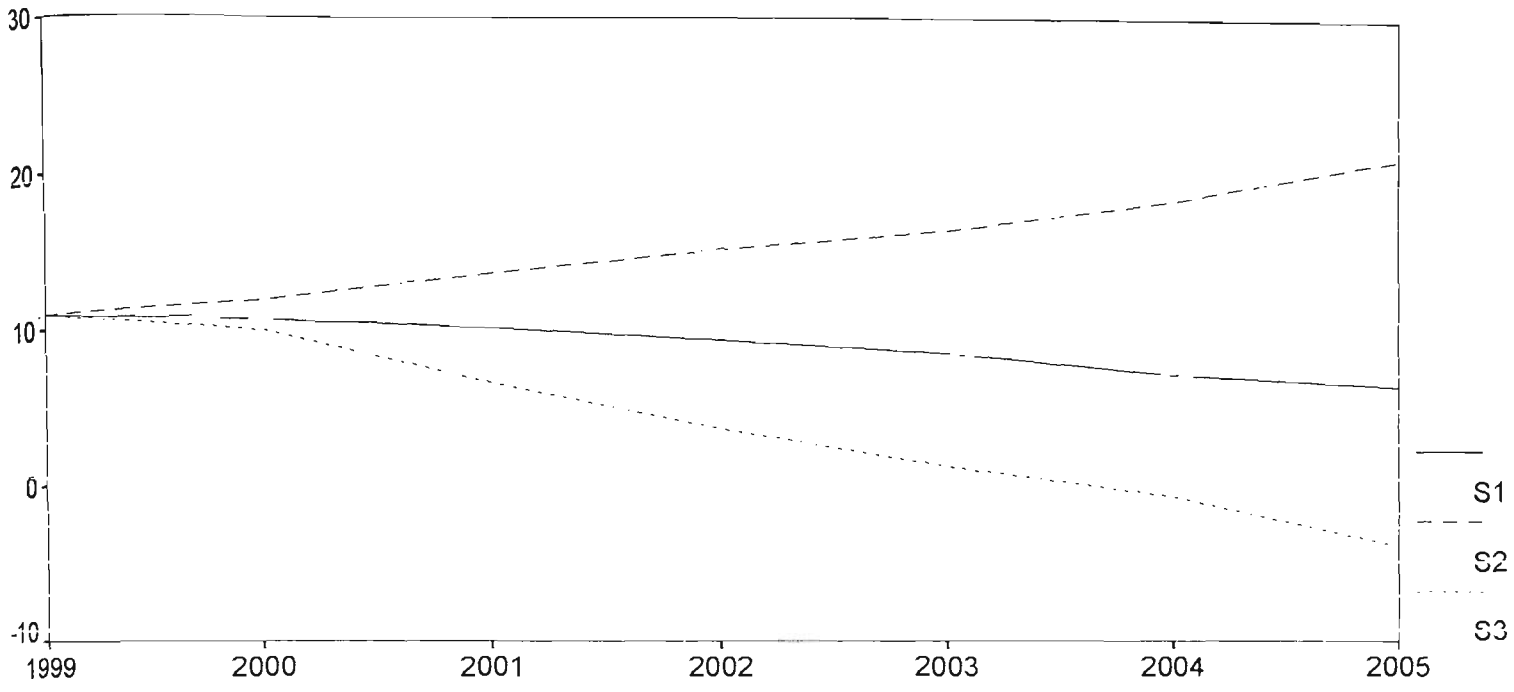
Billions of US Dollars



YEAR

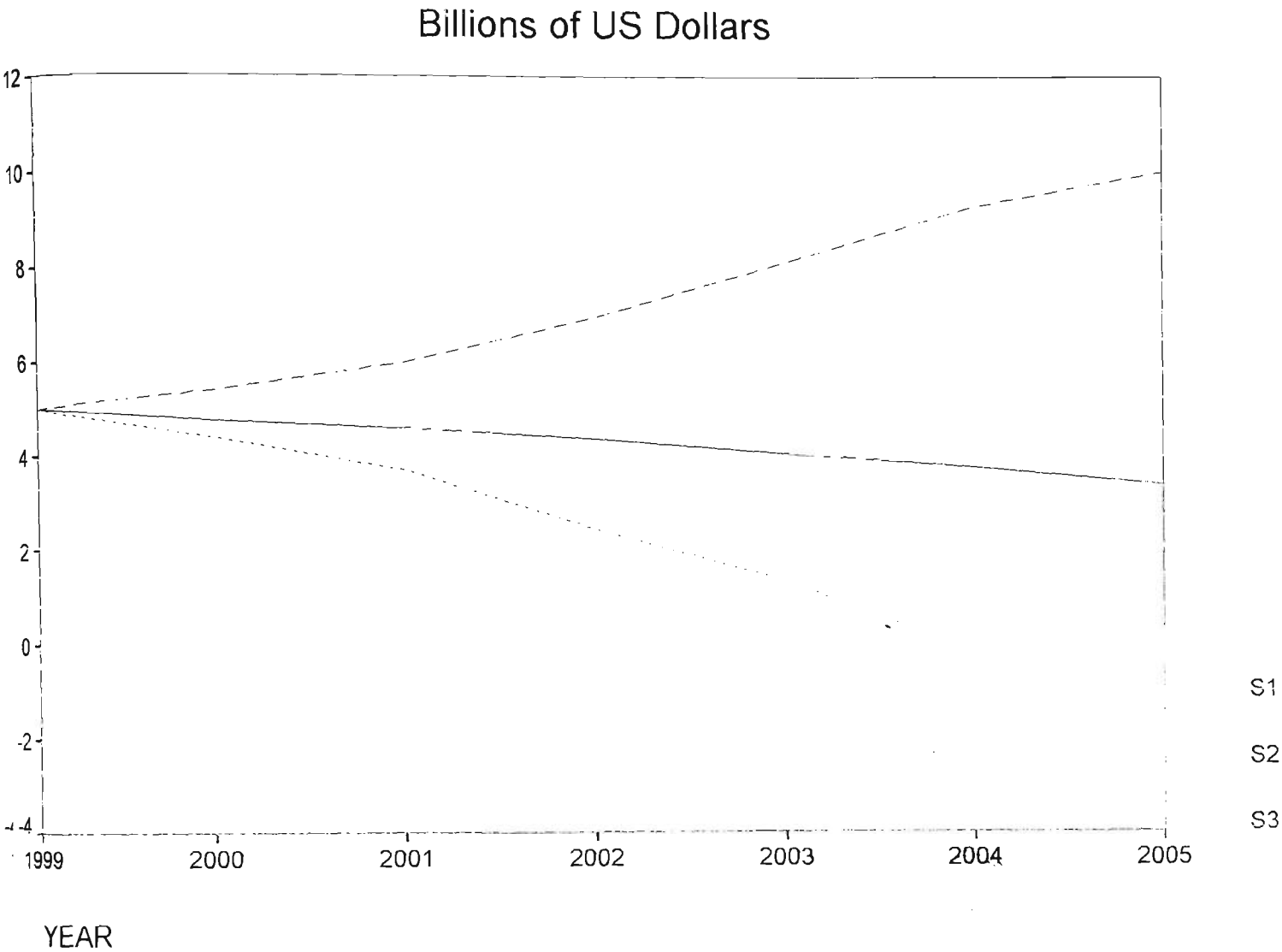
Scenarios for Saudi Resource Balance

Billions of US Dollars



YEAR

Scenarios for UAE Resource Balance



9.4 Analysis of the Forecasting Model Results

The results in Table 9.2-9.5 and the graphs would seem to suggest that:

1. The surplus in the resource balance of all GCC countries will decline continuously over the next five years according to Scenario 1. The surplus in the resource balance of Kuwait in the year 2005 will be approximately 61 percent of its level in the year 1999. The corresponding figures for Oman, Saudi Arabia and the United Arab Emirates are 72%, 58% and 63% respectively. The decline in the surplus is due to the pressure exerted on the balance of payments by the growth in domestic absorption as a result of the assumed 3 percent growth in government expenditure. The increase in this expenditure promotes growth in non-oil income. This in turn results in an increase in imports of goods and services. The increase in imports will be much greater than the increase in exports, given the assumption of relative stability in oil prices and constant quotas. Exports of oil, which comprise the bulk of exports, will increase slightly due to the assumed growth in world economy and consumption of major trading partners.

2. An improvement in the oil market conditions combined with healthy growth in the world economy would, according to Scenario II, result in substantial increases in the surplus in the resource balance of the GCC countries. If the price of oil increased ***steadily*** from its 1999 level of $18.00 per barrel by 5 percent per annum to reach $25.30 per barrel in the year 2005, the surplus in the resource balance of Oman, Saudi

Arabia and the United Arab Emirates in this year would be approximately double its level in the year 1999. The Kuwaiti surplus in the year 2005, according to this scenario, would be approximately 73 per cent higher than its 1999 level. The substantial increases in the surplus result from the growth in oil exports due to price increases, growth in the world economy and oil consumption of the major trading partners. The increases in exports of goods and services exceed the increases in imports of goods and services which result from growth in domestic absorption.

3. According to Scenario III, the balance of payments of the GCC countries would experience serious deterioration if oil prices were reduced steadily and the growth in world economy and in the oil consumption of the major trading partners were weak. Thus a reduction in oil price from its current level of $18 per barrel to $13.25 per barrel would turn the surpluses enjoyed by the GCC countries into huge deficits. The Saudi resource balance, for example, will turn from a current surplus of almost 11 billion dollars to a deficit of approximately 4 billion dollars. The current surplus of the United Arab Emirates of 5 billion dollars would, according to this scenario, turn into a deficit of 1.433 billion dollars. Similarly, the Kuwaiti resource balance will change from a current surplus of over 4 billion dollars to a deficit of 1.1 billion dollars. Even Oman, which is not an OPEC member and does not have to abide by any quota, will not be saved from the serious unfavorable effects of the reduction in oil prices. According to this scenario, the surplus in the resource balance of Oman could turn from a surplus of 1.789 billion dollars when oil sells at $18.00 per barrel,

to a deficit of 0.467 billion dollars when the price of oil is reduced to $13.25 per barrel.

4. The results of the three scenarios suggest that Oman would be the least affected state by the reduction in oil prices while Saudi Arabia would be the worst. This may be due to the fact that Oman, being a non-OPEC member may try to partially compensate the unfavorable effects of the slump in oil prices by increasing the volume of its oil exports. Saudi Arabia, on the other hand is the largest OPEC exporter who tries to stabilize prices as much as possible.

5. The serious impact of the fluctuations in oil prices on the balance of payments of the GCC countries is due mainly to the heavy dependence of these countries on the oil sector. Diversification of the economy is, perhaps, the only hedge against these fluctuations.

9.5 Conclusions

The main conclusions of this chapter may be summarized in the following:

1. Stabilization in oil prices would not leave the balance of payments of the GCC countries intact. Growth in domestic absorption will result in greater increases in imports of goods and services. This will result in a continuous reduction in the surplus of the resource balance. The pressure on this balance can be alleviated through introduction of economic policies which balance the growth in domestic absorption with the modest growth in exports of goods and services.

2. An improvement in the oil market conditions combined with healthy growth in the world economy would result in substantial increases in the surplus in the resource balance of the GCC countries. These countries could double their surpluses in a period of years if oil prices increased steadily by 5 percent per annum, the world economy grows at 2 per cent per annum, and consumption of oil in major trading partners grows at 4 per cent per annum; provided that the rate of growth in government expenditure did not exceed 3 percent per annum.

3. A reduction in oil prices, combined with slow growth in the world economy and a modest growth in consumption of major trading partners would result in a severe deterioration in the resource balance of the GCC countries, even if these countries rationalize their domestic expenditure.

4. Membership of the OPEC organization has benèfited the GCC members during the seventies and early eighties but limited the maneuver of these countries in facing the impact of a slump in oil prices. Diversification of the GCC economies is, perhaps, the only hedge which the GCC countries have against fluctuations in oil prices. Unfortunately, their efforts to diversify have, so far, made them more dependent on oil. Motivated by their relative comparative advantage in producing oil, these countries concentrated on industries producing petrochemicals and other oil derivatives. This has simply made them more prone to problems of fluctuations in oil prices.

Chapter Ten

CONCLUSIONS

The main findings of this thesis may be summarized in the following:

1. The sharp fluctuation in oil prices has affected the performance of the members' balance of payments tremendously. It was possible to identify four sub-periods over the 1960-1997 period, in which oil prices fluctuated significantly. The sub-periods are: 1960-73 (stability at low prices), 1974-82 (sharp rise in oil prices), 1983-89 (sharp decline in oil prices), and 1990-97 (stability at moderate prices). Analysis of the performance of the GCC balances of payments over these sub-periods revealed the following:

- Even though oil exports still constitute most of the merchandise exports (80-90 per cent), the contribution of oil exports to GDP has declined gradually in all members due to the decline in oil prices.
- The proportion of merchandise imports to GDP remained inflexible in the face of declining oil revenues (around 30 per cent).
- The ratio of trade balance to GDP in the members of the GCC has fluctuated sharply with changes in the world price of oil.
- All the members experienced a continuous deficit in the service balance (import and export of services) and in net current transfers throughout the period.
- The decline in oil exports combined with the deficit in the services balance and net current transfers depleted the gains from trade surplus in all members. This resulted in a continuous decline in the surplus on current account.

- The expected fluctuations in oil prices induced members of the GCC to follow different paths of investment in foreign capital. The oil sector has attracted large direct investment and other long-term capital over the period.

2. The thesis examined the long run relationship between imports and oil exports in the four members using the Engle-Granger approach and the Johansen-Juselius method of cointegration analysis over the period 1967-1996. The Engle-Granger approach revealed no evidence of cointegration between oil exports and imports in the members of the GCC, the only exception was Oman. The superior Johansen-Juselius method indicated the existence of a unique cointegrating vector in three members of the GCC (Oman, Saudi Arabia, and United Arab Emirates). The cointegrating vector confirmed the long-run relation between oil exports and imports in the three members. Kuwait was the only country in which both methods failed to recognize a unique cointegrating vector. The slope coefficients in the Johansen-Juselius regression equations were close to unity in the cases of Oman, Saudi Arabia, and United Arab Emirates. This suggests that the above three members' macroeconomic policies are effective in sustaining long-run equilibrium between oil exports and imports.

3. The Johansen-Juselius multivariate cointegration method was also used to examine the long-run relationship between aggregate imports and the main components of final expenditure in four members of the GCC over the period 1967-1996. The components of final expenditure are: export expenditure, government consumption, private consumption, and investment expenditure. A short-term error correction model was also used to estimate the short-run partial elasticities of imports in the members of the GCC. The cointegration analysis identified a unique cointegrated vector between

aggregate imports and final expenditure in three members only (Kuwait, Oman, and Saudi Arabia). The cointegration results suggest the following:

- Investment expenditure seems to be the most significant determinant of aggregate imports in the long-run in the case of Kuwait, while private consumption is the least significant. The short-run error correction model results indicate that current investment and past period investment and imports are the most significant determinants of imports in the short-run. The empirical results suggest that economic policies which intend to influence the pattern and type of investment expenditure will be more effective in the long-run.
- The cointegrating results in the case of Oman indicates that aggregate exports expenditure is the most significant determinant of aggregate imports in the long-run, while government consumption is the least significant. The results of the short-run error correction model imply that current investment and past period government expenditure are the most significant determinants of imports in the short-run. Economic policies directed toward promoting exports and investment, and the regulation of private consumption should affect the propensity to import in the long-run.
- The cointegration results in the case of Saudi Arabia indicates that government consumption expenditure and private consumption are the most significant determinant of aggregate imports in the long-run, while investment is the least significant. The short-run error correction model results imply that current and past period investment expenditures are the most significant determinants of imports in the short-run. Economic policies directed toward reducing both the public and the

the private consumption expenditures should affect the propensity to import in the long-run.

- The statistical analysis also suggest that there are significant differences between the long-run partial elasticities of imports with respect to the different components of final expenditure in each GCC country considered.

4. A single and simultaneous equations models were used to examine the impact of fluctuations in oil prices on the resource balance of the member states of the GCC. The single equations model indicated that non-oil income and growth in world economy are major determinants of the resource balances of the member states of the GCC. The simultaneous-equations model results suggest the following:

- The resource balance of each GCC member is negatively correlated with non-oil income and positively correlated with growth in the world economy.
- The non-oil income in all GCC countries is more affected by changes in government expenditure than by changes in export revenues during the period of the study. Also, the elasticity of non-oil income with respect to government expenditure is much greater than with respect to exports. Moreover, the response of the non-oil sector to changes in exports and government expenditure is subject to a partial adjustment mechanism.
- The GCC exports are strongly influenced by oil prices and growth in oil consumption of major trading partner.
- The non-oil income is a major determinant of spending on imports in each GCC country. The results also indicate that changes in imports resulting from changes in non-oil income is subject to a partial adjustment mechanism. The speed of

adjustment is similar in the cases of Kuwait and the UAE, slower in the case of Saudi Arabia and much slower in the case of Oman.

- The regression results suggest that the elasticity of GCC imports from its major trading partners with respect to the GCC exports to these partners differ significantly.
- The simultaneous-equations model results suggest that the behavior of the Omani economy, a non-OPEC member, differs to a significant extent, from that of other GCC (OPEC) Members. This difference is reflected in the magnitudes of the marginal propensity to import, elasticity of imports and speed of adjustment of non-oil revenue to government expenditure and exports and of imports to non-oil income.

5. The trade relationship between the GCC, as an integrated unit, and its major trading partners was also examined by a simultaneous equations model to capture the feedback effects. The GCC integration can significantly affect the trade relationship with major economic powers. The major trading partners of the GCC are the EU, the USA and Japan. These three regions import well over 50 percent of total GCC exports (mainly oil) and supply approximately 62 percent of total GCC imports. The simultaneous-equations model results suggest the following:

- The GCC exports to each of its three major trading partners are strongly influenced by oil prices and growth of GDP in the trading partner. The results also suggest that GCC imports from each trading partner is positively related to the GCC exports to the specific partner within a partial adjustment mechanism.

- The short-run marginal propensity of GCC imports from Japan (with respect to the GCC oil exports to Japan) is much less than the short-run propensity of imports of the GCC from both the USA and the EU (with respect to the GCC exports to these two regions). The long-run marginal propensity of the GCC imports from the EU is greater than that for imports from Japan and the latter is greater than that for imports from the USA. The results also suggest that the short-run elasticity of the GCC imports from Japan (with respect to the GCC exports to that country) is less than the short-run elasticity of the GCC imports from the USA but greater than the short-run GCC elasticity of the GCC imports from the EU. However, the long-term elasticity of the GCC imports from Japan is less than the long-term elasticity of the GCC imports from the USA and the EU.
- The simultaneous-equations model results indicate that there are very significant feedback effects in GCC trade with the USA, the EU and Japan. These feedback effects may be due to the relatively large size of total GCC imports from and exports to each of these regions.
- Trade of each separate member of the GCC with the USA, the EU and Japan may not generate any significant feedback. But when taken together, as one integration, these members seem to have a strong impact on the major economic powers.

6. The regression results of the simultaneous equations models which were developed and tested to examine the impact of the external and internal forces on GCC members' balance of payments were used in forecasting the future behavior of these balances under various scenarios. The first scenario (status quo) assumed a constant price of oil, and growth in the world economy and consumption of oil in major trading partners at current rates. The second scenario (optimistic) assumed a steady rise in the

price of oil over the next five years and relatively high growth rates in world income and consumption of oil in major trading partners. The third scenario (pessimistic) assumed a continuous decline in oil prices over the next five years. The forecasting analysis revealed the following:

- Stabilization in oil prices will affect the balance of payments of the GCC countries. Growth in domestic absorption will result in greater increases in imports of goods and services. This will result in a continuous reduction in the surplus of the resource balance.
- An improvement in the oil market conditions combined with healthy growth in the world economy would result in substantial increases in the surplus in the resource balance of the GCC countries. These countries could double their surpluses in a period of years if oil prices increased steadily by 5 percent per annum, the world economy grows at 2 per cent per annum, and consumption of oil in major trading partners grows at 4 per cent per annum; provided that the rate of growth in government expenditure did not exceed 3 percent per annum.
- A reduction in oil prices, combined with slow growth in the world economy and a modest growth in consumption of major trading partners would result in a severe deterioration in the resource balance of the GCC countries, even if these countries rationalize their domestic expenditure.
- Diversification of the GCC economies can reduce the impact of fluctuations in oil prices. However, most of the new industries in the members of the GCC concentrated on producing petrochemicals and other oil derivatives. This has simply made them more dependent on oil and, therefore, more inclined to be affected by fluctuations in oil prices.

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Appendix One

The Concept of Cointegration

A1 Introduction

Cointegration analysis was developed in mid 1980's, and since then many econometricians have regarded it as the most important recent development in empirical modeling. The fact that time series data are intensively used in empirical research encouraged econometricians to devote careful attention to such data. In regression analysis an important assumption involving time series data states that such data must be stationary. With non-stationary data standard econometric estimation may result in a misleading statistical and subsequently economic Inferences. Cointegration analysis evolved as a tool to determine the stationarity of the time series data and whether they have a meaningful long-run relationship.

This Appendix will introduce the concept of cointegration and highlights its importance in empirical research. Section two will define stationary time series and then develop the appropriate tests to find whether a time series is stationary. Section three discusses the practical implications of spurious regression and distinguishes between a trend-stationary (TS) and a difference stationary (DS) time series. Section four addresses the issues of cointegration, error correction model (ECM), and the integration of short run dynamics with long run equilibrium.

A1.2 Stationary and Non-Stationary Time Series

The empirical work based on time series data assumes that the underlying time series is stationary. Any time series can be thought of as being generated by stochastic (random) process. A fixed set of data can be regarded as a realization of the underlying stochastic process. A stochastic process is said to be stationary if its mean and variance are constant over time. And the value of covariance between two time periods depends only on the distance or lag between two time periods and not on the actual time at which the covariance is computed, Gujarati, (1995).

Let y_t be a stochastic time series with these properties:

The Mean: $E(y_t) = \mu$.

The Variance: Var $(y_t) = E(y_t - \mu)^2 = \sigma^2$.

The Covariance: $\gamma_k = E\left[(y_t - \mu)(y_{t+k} - \mu)\right]$

$= \text{Cov}\left(y_t, y_{t+k}\right)$.

If k = 0, we obtain γ_0, which is simply the variance of y ($= \sigma^2$) .

Now suppose we shift the origin of y from y_t to y_{t+m}. For y_t to be stationary, the mean, variance and auto covariance must be the same as those of y_t .

The above stationarity is known as weak stationarity, and will be found in most practical situations. A time series is said to be strictly stationary if the joint distribution of any set of n observations $y(t_1), y(t_2), \ldots\ldots, y(t_n)$ is the same as the joint distribution of $y(t_1+k), y(t_2+k), \ldots\ldots, y(t_n+k)$ for all n and k.

If n = 1, then $\mu(t) = \mu$ and $\sigma^2 = \sigma$ for all t.

If n = 2, we get the result that the joint distribution of $y(t_1)$ and $y(t_2)$ is the same as that of $y(t_1+k)$ and $y(t_2+k)$, writing $t_1+k = t_2$ will yield the same distribution of $y(t_2)$ and $y(t_2+k)$. Thus, stationarity depends only on the difference (t_2-t_1) or the lag. The auto covariance $\gamma(t_2-t_1)$ can be rewritten as $\gamma(k)$ where $k = t_2 - t_1$.

Thus $\gamma(k) = \text{cov}\left[X(t) + X(t+k)\right]$

$\gamma_0 = \text{var } y(t_1+k) = \sigma^2$.

The autocorrelation coefficient $P(k)$ at lag k is

$$P(k) = \frac{\gamma(k)}{\gamma(0)} \qquad (1)$$

A plot of $P(k)$ against k is called the correlogram and $\left|-1 \le p(k) \le 1\right|$

The stochastic process is purely random if its autocorrelation at any lag greater than zero is zero. To test the joint hypothesis that all $P(k)$ autocorrelation are simultaneously equal to zero (stationary). The Q statistics developed by Box and Pierce or the Ljung-Box (LB) statistics can be used to reject or accept the null hypothesis, Maddala (1992).

A1.2.1 The Unit Root Test of Stationarity

The unit root test is an alternative test of stationarity that has become very popular. Consider first the model

$$y_t = \rho y_{t-1} + U_t \qquad (2)$$

Where U_t is a white noise error term (zero mean, constant variance σ^2, and is non autocorrelated). Now if ρ the coefficient of y_{t-1} is equal to one (ρ=1), the stochastic y_t has a unit root. A time series that has a unit root is known as a random walk, and is an example of a non-stationary time series.

Note that $y_t = y_{t-1} + U_t$ can be rewritten as

$$y_t - y_{t-1} = U_t$$

Using the lag operator L so that

$Ly_t = y_{t-1}$, $L^2 y_t = y_{t-2}$ we can write (2) as $(1-L)y_t = U_t$.

The term unit root refers to the root of the polynomial in the lag operator.

In the random walk model (2)

Let $y_0 = 0$ at time t = 0

$$y_1 = U_1$$

$$y_2 = y_1 + U_2 = U_1 + U_2$$

$$y_3 = y_2 + U_3 = U_1 + U_2 + U_3$$

and in general

$$y_t = \Sigma U_t$$

Therefore

$$\mathrm{E}(y_t) = \mathrm{E}(\Sigma U_t) = t, \mu$$

$$Var(y_t) = t, \sigma^2$$

Since both the mean and the variance of y change with time, the process is non-stationary. But we note that the first difference of a random walk time series is stationary, since U_t is purely random assumption

$$y_1 - y_2 = U_2$$

Equation (2) is often expressed in an alternative form as

$$\Delta y = (\rho - 1) y_{t-1} + U_t \qquad (3)$$

$$= \delta y_{t-1} + U_t$$

Where $\delta = (\rho - 1)$ and where Δ is the first difference operator. The null hypothesis however is $\delta = 0$.

Note that

$$y_t - y_{t-1} = (\rho - 1) y_{t-1} + U_t$$

$$y_t = \rho y_{t-1} + U_t$$

Thus equation (3) equals equation (2)

if $\delta = 0$

$$\Delta y = (y_t - y_{t-1}) = U_t$$

A1.2.2 The Augmented Dickey Fuller (ADF) Test

In general if a time series has to be differenced d times in order to achieve stationarity. Such time series is said to be integrated of order *d* denoted by *I(d)*. Under the null hypothesis that $\rho = 1$, the conventionally computed *t*-statistic is known as the τ (tau) statistics. Dickey and Fuller tabulated the critical values of the (tau) statistics on the basis of Monte Carlo simulations. The tau test is known as the Dickey-Fuller (DF) test. If the computed absolute values of τ statistic exceed the (DF) critical values, we do not reject the hypothesis that the given time series is stationary.

The Dickey-Fuller test is applied to regressions in the following forms:

$$\Delta y_t = \delta y_{t-1} + U_t \qquad (4)$$

$$\Delta y_t = B_1 + \delta y_{t-1} + U_t \qquad (5)$$

$$\Delta y_t = B_1 + B_2 t + \delta y_{t-1} + U_t \qquad (6)$$

Where t is the time or trend variable. Equation (5) and (6) differ from equation (4) by including the constant and the trend term (Gujarati, 1995).

Dickey and Fuller (1979) (1981), Philips and Perron (1988), Bhargava (1983), Evans and Savin (1981) (1984), and others developed modifications of the Dickey-Fuller tests when U_t is not white noise. These tests, called the "augmented" Dickey Fuller (ADF) tests, involve estimating the equation

$$\Delta y_t = B_1 + B_2 t + \delta y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta y_{t-i} + U_t \qquad (7)$$

where for example $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$.

The test statistic is the ratio of estimated B to its calculated standard error obtained from an ordinary least square (OLS) regression. The null hypothesis is $H_0: X_t$ ~ I(1), this is rejected if estimated B is negative and significantly is different from zero. The ADF test statistics has the same asymptotic distribution as the DF statistic, so the same critical values can be used.

A1.2.3 The Philip Perron (PP) Test

Phillips and Perron (1988) developed an alternative test for a unit root. The PP test is used for non-parametric correction for serial correction. Similar to the ADF test, the PP test is a test of the hypothesis $\rho = 1$ in the equation

$$\Delta Y_t = \mu + \rho Y_{t-1} + \varepsilon_t \qquad (8)$$

Unlike the ADF test, there are no lagged difference terms. Instead, the equation is estimated by OLS, with the optional inclusion of constant and time trends. The *t*-statistic of the coefficient is then corrected for serial correlation in *t*. The Newey and West (1987) method is used to construct a weighted estimate of the error variance from the estimated residuals ε_t as:

$$\frac{1}{N}\sum_{t=1}^{N} \hat{\varepsilon}_t^2 + \frac{2}{N}\sum_{s=1}^{l} \omega(s,l) \sum_{t=s+1}^{N} \hat{\varepsilon}_t \hat{\varepsilon}_{t-1} \qquad (9)$$

Where l is truncation lag parameter and

$$\omega(s,l) = \frac{(1-s)}{(l+1)}$$

A1.3 Spurious Regression

In regressions involving time series data, the time or trend variable is often included as one of the explanatory variables to avoid the problem of spurious correlation. Since time series data often tend to move in the same direction overtime, a high R^2 between two variables may not reflect the true degree of association between them, but simply the common trend present in them. Econometricians differentiate between deterministic and stochastic trend. The trend is deterministic if it is perfectly predictable and not variable, or in other words the time series does not have a unit root.

Two key concepts in time series analyses are, trend stationary process (TSP) and a difference-stationary process (DSP), Nelson and Plosser (1982).

The model

$$Y_t = B_1 + B_2 t + U_t \qquad (10)$$

U_t is stationary with zero mean and variance σ^2, then (7) is TSP. If the trend $(B_1 + B_2 t)$ is subtracted from (7), the result is a stationary process.

However, in the regression

$$y_t - y_{t-1} = \alpha + U_t \qquad (11)$$

where U_t is stationary with zero mean and variance σ^2, and α is constant. Model (8) is DSP.

Thus, a stationary time series represents a TS process, whereas a non-stationary time series represents a DS process. Nelson and Plosser (1982), indicated that for most economic time series the DSP model is more appropriate and the TSP model would be relevant only if the error term U_t is assumed to be highly autocorrelated.

Spurious regression refers to the process of obtaining results that look good but on further examination they look suspicious. An extremely high R^2 and t-ratio and low Durban-Watson (d) is an indication of spurious regression. Spurious regression can be the result of regressing one non-stationary time series on another non-stationary time series. In such case the standard t and F testing procedures are not valid. The question to be raised is if y and x are non-stationary and Δy and Δx are stationary, then why not regress Δy on Δx. The answer is in taking the first or higher order difference we may lose an important long-run relationship between y and x. Most economic theory is postulated as a long-term relationship between variables in the level form. As Grange notes " A test for cointegration can be thought of as a pre-test to avoid spurious regression situations".

A1.4 Cointegration

The need to integrate short-run dynamics with long-run equilibrium is an important issue in econometrics. For example, consumption and income are likely to be cointegrated. If they were not, consumption might drift above income, which ultimately would be infeasible, or consumption might drift so far below income that consumers were irrationally increasing saving. Examples of such variables are interest rates on assets of different maturities, prices of a commodity in different parts of the country, income and expenditure by local government, and the value of sales and production costs of an industry. More possible examples would be imports and exports, and money supply and prices, Granger (1981).

The partial adjustment model is the traditional approach to modeling short-run disequilibrium. An extension of this is the ECM (Error Correction Model) which

incorporates past period's disequilibrium. The theory of cointegration developed in Granger (1981) and elaborated in Engle and Granger (1987), addresses this issue of integrating short-run dynamics with long-run equilibrium. The essence of Engle and Granger method for cointegration is that two non-stationary variable are cointegrated and have long-run equilibrium relation if there exist a stationary linear combination between them, Maddala (1992).

$$y_t = B_1 + B_2 X_t + U_t \qquad (12)$$

if we write

$$U_t = y_t - B_1 - B_2 X_t \qquad (13)$$

and find that U_t or the linear combination $y_t - B_1 - B_2 X_t$ is I(0) or stationary, then we say that the variables y and x are cointegrated. We also see that when U_t is I(0), the trends in y and x cancel on t. In general, if y is I(d) and X is also I(d) where d is the same value, these two series can be cointegrated (move together in the long-run). The regression on the levels of the two variables is meaningful (not spurious). If we were to use their first difference, we will not lose any valuable long-term information. The major difference between an I(0) and I(1) series is that , an I(0) series has a mean and there is tendency for the series to return to the mean , or it tends to fluctuate around the mean. Autocorrelation decline rapidly as lag increases and the process gives low weights to events in the medium to distant past .An I(1) process will wander widely and will only rarely return to an earlier value, Granger (1981).

A number of methods for testing for cointegration have been proposed such as Engle-Granger (EG) or Augmented Engle Granger (AEG) test. In AEG test, we subject the residual estimated from (9) to the DF unit root test

$$\Delta U_t = B_1 U_{t-1} \qquad (14)$$

If the absolute terms of the estimated τ value of 3.673 exceeds any of the Engle-Granger critical values, the conclusion would be that the estimated U_t is stationary (no unit root). Therefore, Y and X despite being individually non-stationary are cointegrated.

In the case of more than two variables there can be more than one cointegrating regressions. Each of them is a long-run equilibrium relationship, and all linear combinations are equilibrium relationships. However, they may not all have meaningful economic interpretation and we have to choose the linear combinations that make economic sense. Cointegration is a purely statistical concept and cointegrated relationships need not have any economic meaning, Engle and Granger (1987). Johansen and Juselius (1990) experienced this problem in their estimation of the long-run demand for money functions in Denmark and Finland. For the Danish data, there was only one cointegrated relationship, making the estimation of a long-run demand for money function easy. But for the Finland data, there were three cointegrated vectors, and this caused problem of identification and interpretation. Dickey and Rossana (1994) showed the relation between testing for unit roots in single equations and testing the cointegrating vectors in a multivariate system. Using wage and price data from the manufacturing sector of the United States economy, they found evidence of cointegration and long-run relationship between the variables. But when the cointegration vector was used to test the logical restriction of using real wages instead of nominal wages, the likelihood ratio test rejected the restriction.

A1.4.1 Cointegration and Error Correction Models

If Xt and Yt are cointegrated, there is a long-run relationship between them. Furthermore, the error correction model (ECM) can describe the short-run dynamics. This is known as the *Granger representation theorem*.

If Xt~I(1), Yt~I(1), and Zt=Yt- βXt is I(0), then x and y are said to be cointegrated. The Granger representation theorem states that in this case Xt and Yt may be generated by ECMs of the form:

$$\Delta X_t = \rho_1 Z_{t-1} + \text{lagged } (\Delta X_t, \Delta Y_t) + \varepsilon_{1t} \qquad (15)$$

$$\Delta Y_t = \rho_2 Z_{t-1} + \text{lagged } (\Delta X_t, \Delta Y_t) + \varepsilon_{2t} \qquad (16)$$

The close relationship between cointegration and error correction model has been used widely in economics. The relationship is simply that a proportion of the disequilibrium from one period is corrected in the next period. For example, the change in price in one period may depend upon the degree of excess demand in the previous period. Engle and Granger suggest estimating the cointegrating regression first and then estimating the short-run dynamics through variants of ECM by a two-stage estimation method using the estimated coefficient from the cointegrating regression, Engle and Granger (1987).